

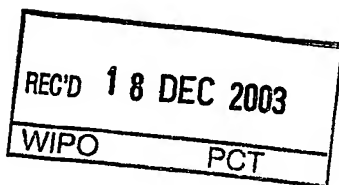


PC/EP 03/116347
10/531779
Rec'd CT/PTO 19 APR 2005

INVESTOR IN PEOPLE



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THE PATENT OFFICE

30 OCT 2002

Request for grant of a patent

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The
Patent
Office

1/77

The Patent Office
Cardiff Road
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1.	Your reference	GB Case	ELJ-22773/P1	30OCT02 E759714-1 003069
2.	Patent application number (The Patent Office will fill in this part)	0225244.3 1700 0.00-0225244.3		
3.	Full name, address and postcode of the or of each applicant (underline all surnames)	Ciba Specialty Chemicals Holding Inc Klybeckstrasse 141 4057 Basel Switzerland 30 OCT 2002		
	Patent ADP number (if you know it)	08468753001 ✓		
	If the applicant is a corporate body, give the country/state of its incorporation	Switzerland		
4.	Title of invention	ELECTROLUMINESCENT DEVICE		
5.	Name of your agent (if you have one) "Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)	Ciba Specialty Chemicals Holding Inc Patents Department PO Box 38 Cleckheaton Road Low Moor Bradford West Yorkshire BD12 0JZ 08192080001 ✓		
6.	If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)	Date of filing (day/month/year)
7.	If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application		Date of filing (day/month/year)
8.	Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if: a) any applicant named in part 3 is not an inventor, or b) there is an inventor who is not named as an applicant, or c) any named applicant is a corporate body. (see note (d))	YES		

Patents Form

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form -

Description 41

Claim(s) 13

Abstract 1

Drawing(s) - DMC

10. If you are also filing any of the following, state how many against each item.

Priority documents -

Translations of priority documents -

Statement of inventorship and right to grant of a patent (Patents Form 7/77) -

Request for preliminary examination and search (Patents Form 9/77) -

Request for substantive examination (Patents Form 10/77) -

Any other documents (please specify) -

11.

I/We request the grant of a patent on the basis of this application

Signature

Date

C. Choppen

30 October 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

Catherine Choppen 01274 417558

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Notes

- If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505.*
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Patents Form 1/77

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ELECTROLUMINESCENT DEVICE

The present invention relates to organo-electroluminescent (EL) devices, in particular EL devices that comprise durable, blue-emitting organo-electroluminescent layers. The organo-electroluminescent layers comprise certain organic compounds containing one or more pyrimidine moieties.

Background

Progress has been made towards developing organic-based electroluminescent devices suitable for full color displays. Generally, an EL device is comprised of a light-emitting layer or layers and a pair of facing electrodes sandwiching the light-emitting layer(s). Application of an electric field between the electrodes results in the injection of electrons and holes to the system, resulting in the release of energy as light.

However, organo EL devices have not been developed that have suitable stability under continuous operation. In particular, there remains a need for blue-emitting, stable organo EL devices.

U.S. Pat. No. 5,104,740 teaches an electroluminescent element that comprises a fluorescent layer containing a coumarinic or azacoumarinic derivative and a hole transport layer, both made of organic compounds and laminated on top of the other.

U.S. Pat. No. 6,280,859 discloses certain polyaromatic organic compounds for use as a light-emitting material in organo-electroluminescent devices.

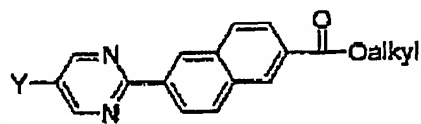
U.S. Pat. No. 5,116,708 is aimed at a hole transport material for EL devices.

WO98/04007 and EP-A-1013740 relate to an electroluminescent arrangement with the electron-conducting layer containing one or more compounds comprising triazine as basic substance.

EP-A-1013740 discloses the use of triazine compounds in EL devices.

WO02/02714 relates to electroluminescent iridium compounds with fluorinated phenylpyridines, phenylpyrimidines, and phenylquinolines and devices made with such compounds.

US-A-5,770,108 describes liquid crystal compositions comprising pyrimidine compounds of

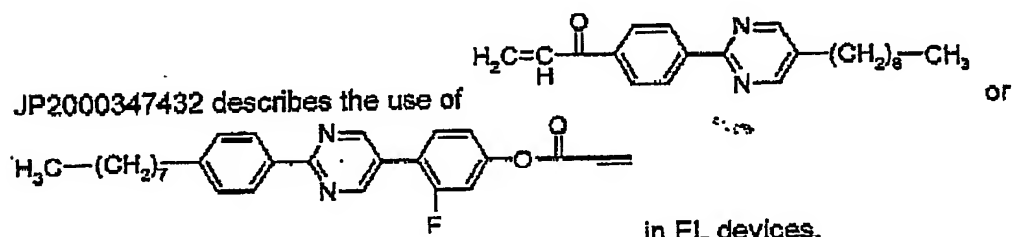


the following formula

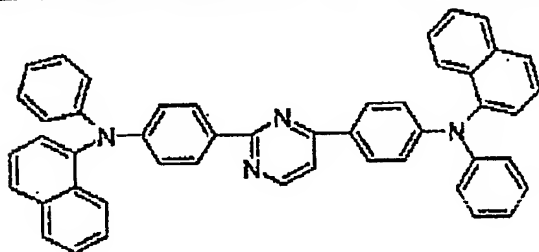
, wherein Y is alkyl or -O-alkyl and

liquid crystal element comprising said composition.

WO01/05863 relates to EL devices comprising arylamine-substituted poly(arylene vinylenes).

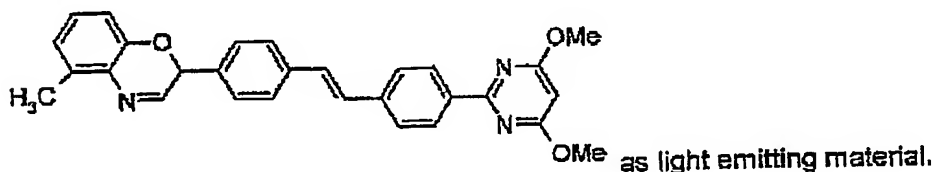


EP-A-926216 relates to EL devices using triaryl amine compounds, such as

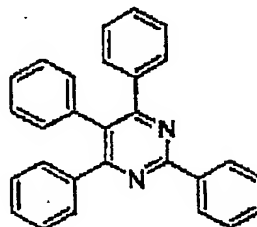


EP-A-690 053 relates to the use of conjugated compounds containing two or more pyrimidine rings, which are part of the conjugated system, as electroluminescent materials. The conjugated compounds described in EP-A-690 053 comprise pyrimidin-2,5-diyl groups which do not carry substituents at positions 4 and 6.

EP-A-563009 relates to EL devices comprising



US-A-5,077,142 relates to EL devices comprising a number of organic compounds as light



emitting material. A pyrimidine moiety, possible organic compounds.

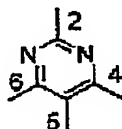
, is listed among a long list of

Certain organic compounds containing one or more pyrimidine moieties are found to be suitable for use in organo-electroluminescent devices. In particular, certain pyrimidine derivatives are suitable blue emitters with good durability.

Detailed Disclosure

The present invention is aimed at an electroluminescent device comprising an organic light-emitting layer that contains at least one blue-emitting organic compound containing one or more pyrimidine moieties.

Accordingly the present invention relates to an electroluminescent device comprising an anode, a cathode and one or a plurality of organic compound layers sandwiched therebetween, in which said organic compound layers comprise an organic compound containing one or more pyrimidine moieties:



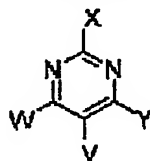
For example, the present organic compounds comprise one, two, three or more pyrimidine moieties, including oligomers and polymers. It is understood that the open valences in the pyrimidine moiety represents a covalent bond that is not limited in its substitution.

In general, the organic compound or compounds emit light below about 520 nm, in particular between about 380 nm and about 520 nm.

The organic compound or compounds have a NTSC coordinate of between about (0.12, 0.05) and about (0.16, 0.10), preferably a NTSC coordinate of about (0.14, 0.08).

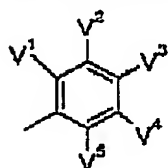
The organic compound or compounds have a melting point above about 150°C, preferably above about 200°C and most preferred above about 250°C.

For example, the organic compound is a pyrimidine compound of formula



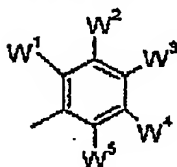
(I), wherein

V is C₆-C₂₄aryl or C₂-C₂₄heteroaryl, which can be substituted or unsubstituted, in particular



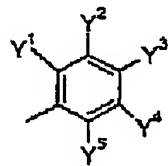
, H, C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl, C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy; C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; -NR⁵R⁶;

W is C₆-C₂₄aryl or C₂-C₂₄heteroaryl, which can be substituted or unsubstituted, in particular



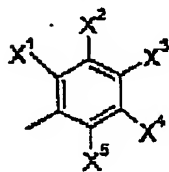
, H, C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl, C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy; C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; -NR⁵R⁶;

Y is C₆-C₂₄aryl or C₂-C₂₄heteroaryl, which can be substituted or unsubstituted, in particular



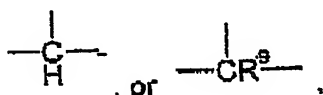
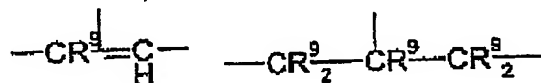
, H, C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl, C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy; C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; -NR⁵R⁶;

X is C₆-C₂₄aryl or C₂-C₂₄heteroaryl, which can be substituted or unsubstituted, in particular



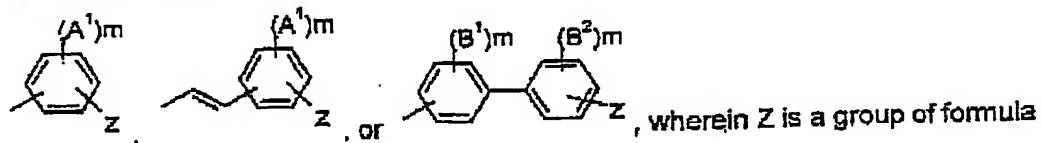
, H; C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl; C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy; C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; -NR⁵R⁶; wherein the groups V¹ to V⁵, W¹ to W⁵, X¹ to X⁵ and Y¹ to Y⁵ are independently of each other H; halogen, C₆-C₁₈aryl; C₆-C₁₈aryl which is substituted by G; C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₇-C₁₈alkylaryl; C₇-C₁₈alkylaryl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl; C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy; C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; -NR⁵R⁶; C₂-C₁₈heteroaryl; C₂-C₁₈heteroaryl which is substituted by L; -SOR⁴; -SO₂R⁴; -COR⁶; -COOR⁷; -CONR⁶R⁶; C₄-C₁₈cycloalkyl; C₄-C₁₈cycloalkyl which is substituted by E and/or interrupted by D; C₄-C₁₈cycloalkenyl; C₄-C₁₈cycloalkenyl which is substituted by E and/or interrupted by D; or W⁵ or Y⁵ together with V form a group -CR⁹₂, -CR⁹₂-CR⁹₂, -C(=O)CR⁹₂, -C(=O)-, or -CR⁹=CR⁹-, or

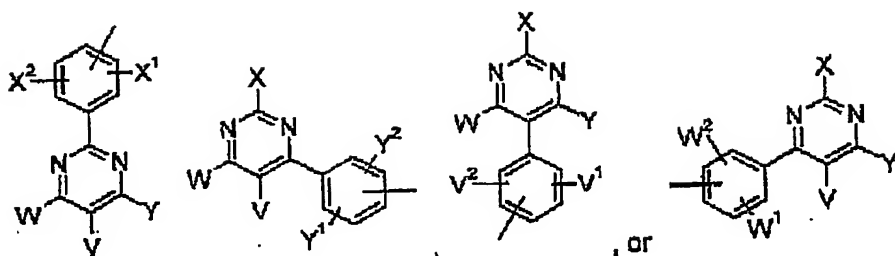
W⁵ and Y⁵ together with V form a group



wherein R⁹ is H; C₁-C₁₈alkyl; C₁-C₁₈alkyl which is interrupted by -O-, C₆-C₁₈aryl, C₆-C₁₈aryl which is substituted by C₁-C₁₈alkyl, or C₁-C₁₈alkoxy, or one of the substituents

V¹ to V⁵, W¹ to W⁵, X¹ to X⁵, or Y¹ to Y⁵ is a group of the formula -Z, -Ar-Z, wherein Ar is C₆-C₂₄aryl or C₅-C₂₄heteroaryl, which can be substituted, in particular





wherein

A¹, B¹ and B² are independently of each other H; C₆-C₁₈aryl; C₆-C₁₈aryl which is substituted by G; C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₇-C₁₈alkylaryl; C₇-C₁₈alkylaryl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl; C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy; C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; -NR⁵R⁶; C₂-C₁₈heteroaryl; C₂-C₁₈heteroaryl which is substituted by L; -SOR⁴; -SO₂R⁴; -COR⁸; -COOR⁷; -CONR⁵R⁶; C₄-C₁₈cycloalkyl; C₄-C₁₈cycloalkyl which is substituted by E and/or interrupted by D; C₄-C₁₈cycloalkenyl; C₄-C₁₈cycloalkenyl which is substituted by E and/or interrupted by D; or two substituents A¹, B¹, B² or B¹ and B² form a five to seven membered ring, which can be substituted,

m is an integer of 1 to 4; and W¹, W², Y¹, Y², X¹, X², V, W, X and Y are as defined above;

D is -CO-; -COO-; -OCOO-; -S-; -SO-; -SO₂-; -O-; -NR⁵-; -SiR⁵R⁶-; -POR⁵-; -CR⁵=CR⁶-; or -C=C-;

E is -OR⁵; -SR⁵; -NR⁵R⁶; -COR⁸; -COOR⁷; -CONR⁵R⁶; -CN; -OCOR⁷; or halogen;

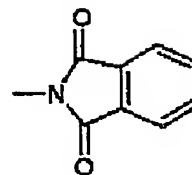
G is E; K; heteroaryl; heteroaryl which is substituted by C₆-C₁₈aryl; C₆-C₁₈aryl which is substituted by E and/or K;

K is C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₇-C₁₈alkylaryl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl; C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy; C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; C₄-C₁₈cycloalkyl; C₄-C₁₈cycloalkyl which is substituted by E and/or interrupted by D; C₄-C₁₈cycloalkenyl; or C₄-C₁₈cycloalkenyl which is substituted by E and/or interrupted by D;

L is E; K; C₆-C₁₈aryl; or C₆-C₁₈aryl which is substituted by G, E and/or K;

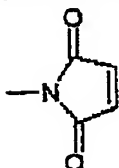
R⁴ is C₆-C₁₈aryl; C₆-C₁₈aryl which is substituted by C₁-C₁₈alkyl, C₁-C₁₈alkoxy; C₁-C₁₈alkyl; or C₁-C₁₈alkyl which is interrupted by -O-;

R⁵ and R⁶ are independently of each other H; C₆-C₁₈aryl; C₆-C₁₈aryl which is substituted by C₁-C₁₈alkyl, C₁-C₁₈alkoxy; C₁-C₁₈alkyl; or C₁-C₁₈alkyl which is interrupted by -O-; or



or

R^5 and R^6 together form a five or six membered ring, in particular



R^7 is H; C_6-C_{18} aryl; C_6-C_{18} aryl which is substituted by C_1-C_{18} alkyl, C_1-C_{18} alkoxy, C_1-C_{18} alkyl;
 C_1-C_{18} alkyl which is interrupted by $-O-$;

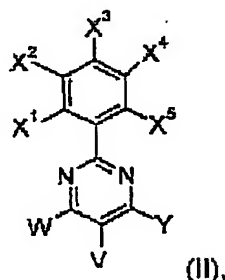
R^8 is H; C_6-C_{18} aryl; C_6-C_{18} aryl which is substituted by C_1-C_{18} alkyl, C_1-C_{18} alkoxy, C_1-C_{18} alkyl;
 C_1-C_{18} alkyl which is interrupted by $-O-$.

or two substituents selected from V^1 to V^5 , W^1 to W^5 , X^1 to X^5 , Y^1 to Y^5 which are in
 neighborhood to each other form a five to seven membered ring.

Preferably at least one, more preferably at least two, most preferably at least three of the
 groups V, W, X and Y are C_6-C_{24} aryl or C_6-C_{24} heteroaryl, which can be substituted.

Preferred are compounds of formula I, wherein at least one of the substituents Y^1 to Y^5 is
 different from H, at least one of the substituents W^1 to W^5 is different from H; at least one of
 the substituents X^1 to X^5 is different from H, and/or at least one substituent V^1 to V^5 is
 different from hydrogen.

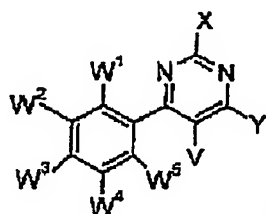
Preferably the electroluminescent device comprises pyrimidine compounds of formula II to
 VI:



(II).

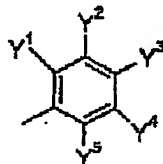
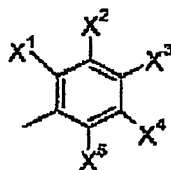
wherein V, W, Y and X^1 to X^5 are as defined above;

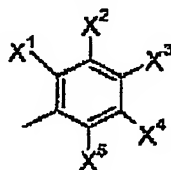
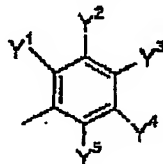
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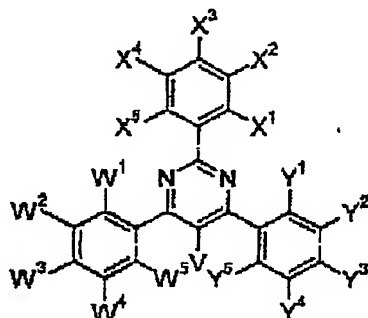


(III),

wherein V, X, Y and W¹ to W⁵ are as defined above, preferably

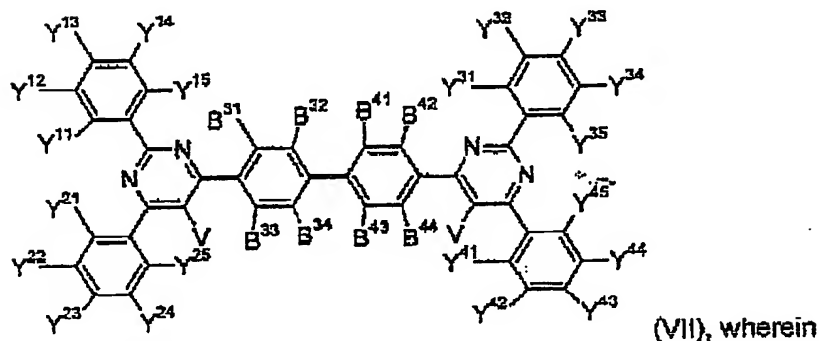
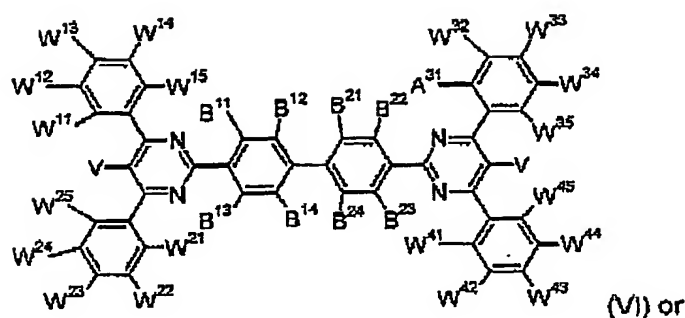


Y is R¹, if X is , or X is R¹, if Y is , R¹ is H, C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl, C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy; C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; or -NR⁵R⁶; wherein X¹ to X⁵, Y¹ to Y⁵, E, D, R⁵ and R⁶ are as defined above, wherein most preferred W¹ and W⁵ and Y¹ and Y⁵ are independently of each other H; C₁-C₁₈alkyl; or C₁-C₁₈alkyl which is substituted by E and/or interrupted by D;



(IV),

wherein V, W¹ to W⁵, X¹ to X⁵ and Y¹ to Y⁵ are as defined above, preferably W³, X³ and Y³ are selected from the group consisting of C₅-C₁₈aryl; C₅-C₁₈aryl which is substituted by G; C₂-C₁₈heteroaryl; C₂-C₁₈heteroaryl which is substituted by L, C₁-C₁₈alkoxy, -SR⁵; -NR⁵R⁶, wherein G, L, R⁵ and R⁶ are as defined above, V is H and/or W¹ and W⁵, Y¹ and Y⁵ as well as X¹ and X⁵ are independently of each other H; C₁-C₁₈alkyl; or C₁-C₁₈alkyl which is substituted by E and/or interrupted by D, wherein E and D are as defined above; or



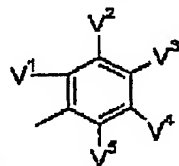
W¹¹ to W¹⁵, W²¹ to W²⁵, W³¹ to W³⁵, W⁴¹ to W⁴⁵, Y¹¹ to Y¹⁵, Y²¹ to Y²⁵, Y³¹ to Y³⁵ and Y⁴¹ to Y⁴⁵ are independently of each other H; C₆-C₁₈aryl; C₆-C₁₈aryl which is substituted by G; C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₇-C₁₈alkylaryl; C₇-C₁₈alkylaryl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl; C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy, C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁶; -NR⁵R⁶; C₂-C₁₈heteroaryl; C₂-C₁₈heteroaryl which is substituted by L; -SOR⁴; -SO₂R⁴; -COR⁸; -COOR⁷; -CONR⁵R⁶; C₄-C₁₈cycloalkyl; C₄-C₁₈cycloalkyl which is substituted by E and/or interrupted by D; C₄-C₁₈cycloalkenyl; C₄-C₁₈cycloalkenyl which is substituted by E and/or interrupted by D;

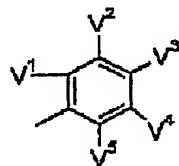
V is H; C₆-C₁₈aryl; C₆-C₁₈aryl which is substituted by G; C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₇-C₁₈alkylaryl; C₇-C₁₈alkylaryl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl; C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy, C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁶; or -NR⁵R⁶; C₂-C₁₈heteroaryl; C₂-C₁₈heteroaryl which is substituted by L; -SOR⁴; -SO₂R⁴; -COR⁸; -COOR⁷; -CONR⁵R⁶; C₄-C₁₈cycloalkyl; C₄-C₁₈cycloalkyl which is substituted by E and/or interrupted by D; C₄-C₁₈cycloalkenyl; C₄-C₁₈cycloalkenyl which is substituted by E and/or interrupted by D;

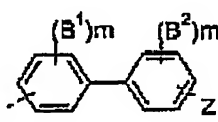
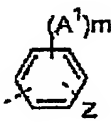
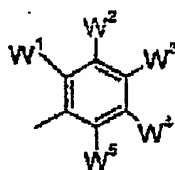
B¹¹ to B¹⁴, B²¹ to B²⁴, B³¹ to B³⁴ and B⁴¹ to B⁴⁴ are independently of each other H; C₆-C₁₈aryl; C₆-C₁₈aryl which is substituted by G; C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or

interrupted by D; C₇-C₁₈alkylaryl; C₇-C₁₈alkylaryl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl; C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy, C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; -NR⁵R⁶; C₂-C₁₈heteroaryl; C₂-C₁₈heteroaryl which is substituted by L; -SOR⁴; -SO₂R⁴; -COR⁵; -COOR⁷; or -CONR⁵R⁸; C₄-C₁₈cycloalkyl; C₄-C₁₈cycloalkyl which is substituted by E and/or interrupted by D; C₄-C₁₈cycloalkenyl; C₄-C₁₈cycloalkenyl which is substituted by E and/or interrupted by D; wherein D, E, G, L, R⁴, R⁵, R⁶, R⁷ and R⁸ are as defined above, V in formula VI or VII is preferably H.

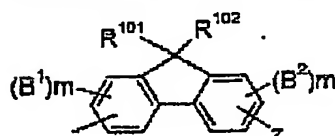
Moreover, pyrimidine compounds of formula I are preferred, wherein V is a group of the



formula , H, C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl, C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy; C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; or -NR⁵R⁶; and

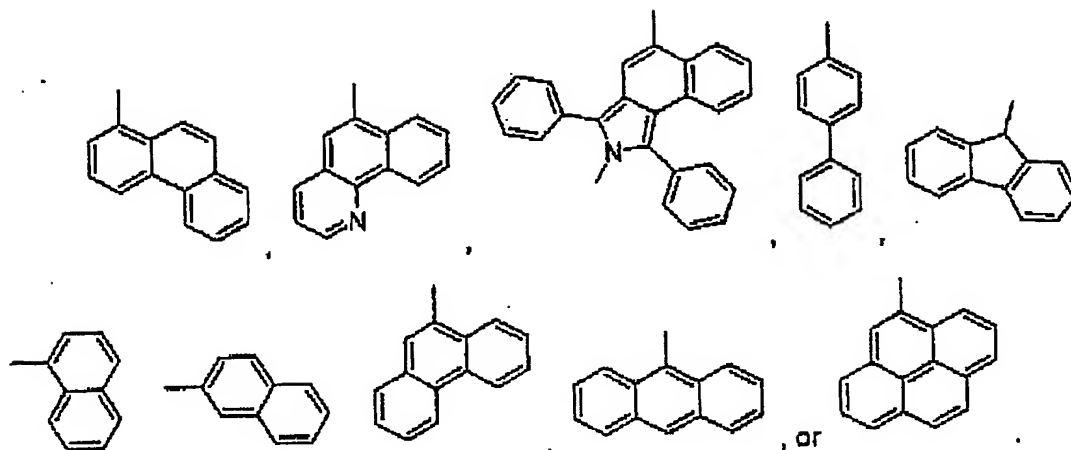


W is a group of the formula

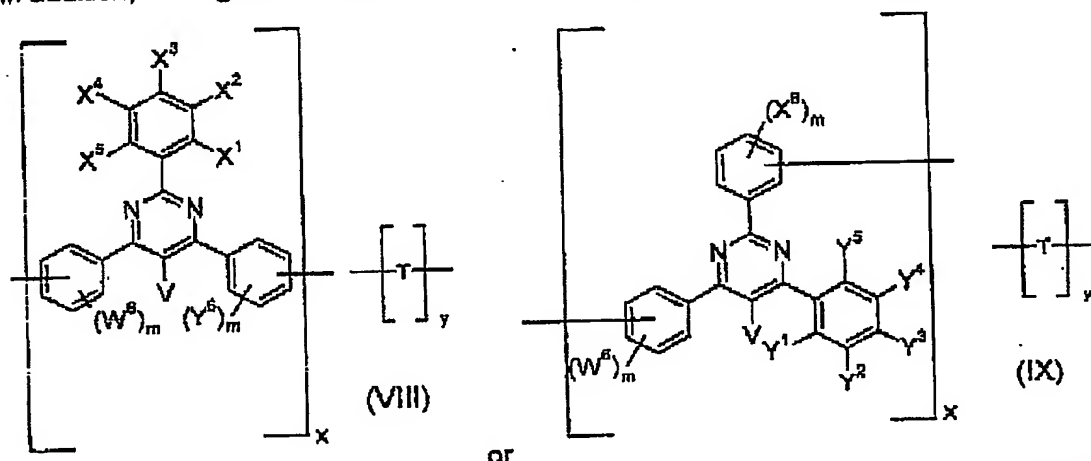


, H, C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl, C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy; C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; or -NR⁵R⁶; wherein W¹ to W⁵, D, V¹ to V⁵, E, A¹, B¹, B², R⁵, R⁶, m and Z are as defined above and R¹⁰¹ and R¹⁰² are independently of each other H, C₁-C₈alkyl, C₆-C₂₄aryl, or C₅-C₇cycloalkyl, in particular H or C₁₋₄-alkyl.

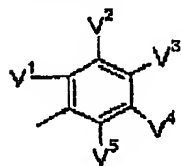
In a preferred embodiment W and Y are groups of the formula



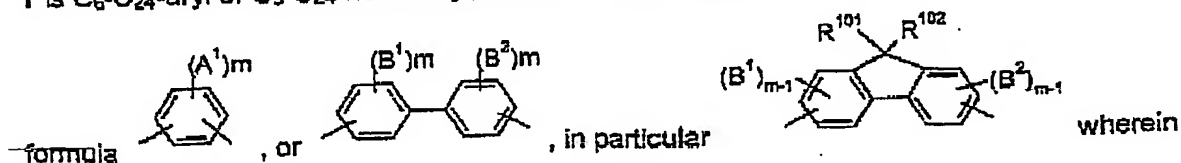
In addition, the organic compound can also be a polymer, comprising the following units:



wherein x is chosen in the range of from 0.005 to 1, preferably from 0.01 to 1, and y from 0.995 to 0, preferably 0.99 to 0, and wherein $x + y = 1$, V is a group of the formula

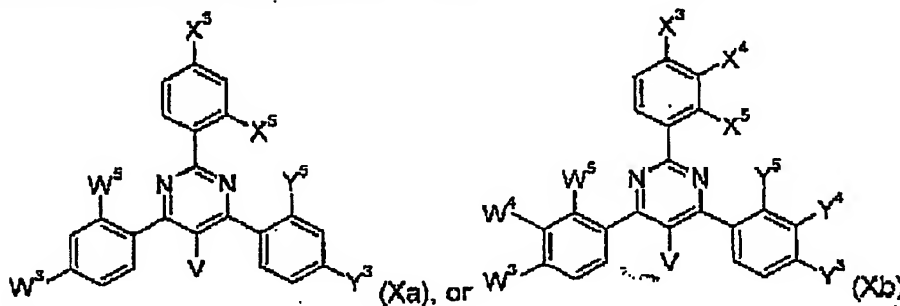


H , C_1 - C_{18} alkyl; C_1 - C_{18} alkyl which is substituted by E and/or interrupted by D ; C_2 - C_{18} alkenyl, C_2 - C_{18} alkenyl which is substituted by E and/or interrupted by D ; C_2 - C_{18} alkynyl; C_2 - C_{18} alkynyl which is substituted by E and/or interrupted by D ; C_1 - C_{18} alkoxy; C_1 - C_{18} alkoxy which is substituted by E and/or interrupted by D ; $-SR^5$; or $-NR^6R^8$; and T is C_6 - C_{24} -aryl or C_5 - C_{24} -heteroaryl, which can be substituted, in particular a group of the



X^1 to X^5 , Y^1 to Y^5 , D , V^1 to V^5 , E , A^1 , B^1 , B^2 , R^5 , R^6 , m are as defined above, W^6 , X^6 and Y^6 independently of each other have the same meanings as X^1 , and R^{101} and R^{102} are independently of each other H, C_1 - C_8 alkyl, C_6 - C_{24} aryl, or C_5 - C_7 cycloalkyl.

Particularly preferred are pyrimidine compounds of the following formula:



wherein V is H, or C_1 - C_8 alkyl,

X^3 and X^4 are independently of each other H, C_1 - C_8 alkyl, C_1 - C_8 alkoxy, C_1 - C_8 thioalkyl, or phenyl,

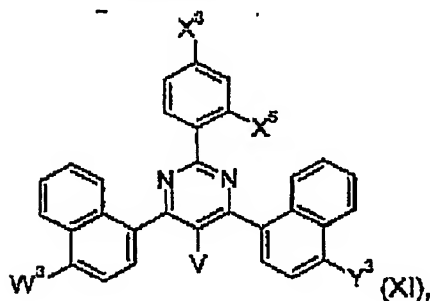
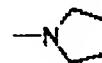
X^5 is H, or C_1 - C_8 alkoxy,

W^5 is H, C_1 - C_8 alkyl, or $O(CH_2)_{m1}-X$,

Y^5 is H, C_1 - C_8 alkyl, or $O(CH_2)_{n1}-X$,

Y^3 , Y^4 , W^3 and W^4 are independently of each other C_1 - C_8 alkyl, C_1 - C_8 alkoxy, C_1 - C_8 thioalkyl, halogen, in particular Br, phenyl, or $O(CH_2)_{n1}-X$, wherein $n1$ is an integer of 1 to 5 and X is $-O-(CH_2)_{m1}CH_3$, $-OC(O)-(CH_2)_{m1}CH_3$, $-C(O)-O-C_1-C_8$ alkyl, $-NR^{103}R^{104}$, wherein $m1$ is an integer of 0 to 5 and R^{103} and R^{104} are independently of each other H, or C_1 - C_8 alkyl, or R^{103}

and R^{104} together form a five or six membered heterocyclic ring, in particular



wherein V is H, or C_1 - C_8 alkyl,

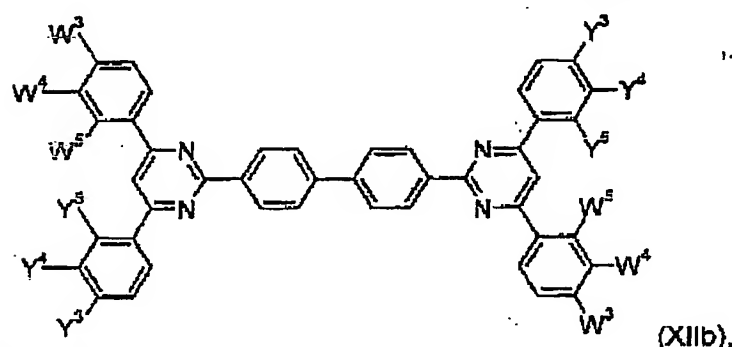
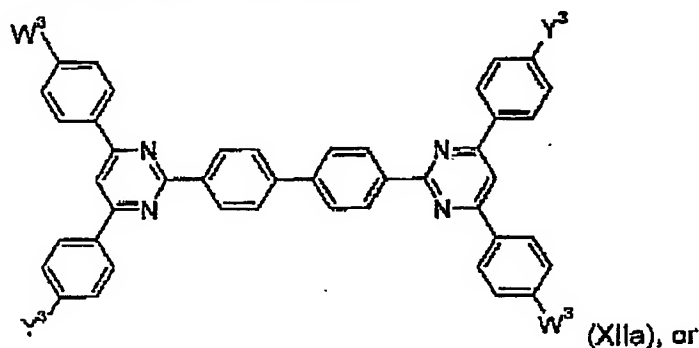
W^3 is H, C_1 - C_8 alkyl, or C_1 - C_8 alkoxy,

X^3 is H, C_1 - C_8 alkoxy, phenyl or $O(CH_2)_{m1}-X$,

X^5 is H, C_1 - C_8 alkoxy, phenyl or $O(CH_2)_{n1}-X$,

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Y^3 is H, C_1-C_8 alkyl, or C_1-C_8 alkoxy, wherein n_1 is an integer of 1 to 4 and X is $-O-(CH_2)_{m_1}CH_3$, $-OC(O)-(CH_2)_{m_1}CH_3$, $-C(O)-O-C_1-C_8$ alkyl, wherein m_1 is an integer of 0 to 5;



wherein W^3 and W^4 are independently of each other H, $-NR^{103}R^{104}$, C_1-C_8 thioalkyl, or C_1-C_8 alkoxy,

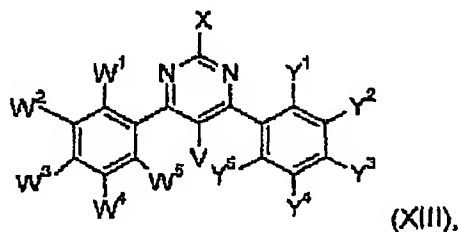
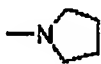
Y^3 and Y^4 are independently of each other H, $-NR^{103}R^{104}$, C_1-C_8 thioalkyl, or C_1-C_8 alkoxy, wherein R^{103} and R^{104} are independently of each other H, or C_1-C_8 alkyl.

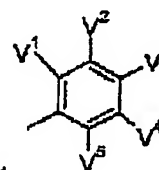
W^5 is H, C_1-C_8 alkyl, or $O(CH_2)_{n_1}X$,

Y^6 is H, C_1-C_8 alkyl, or $O(CH_2)_{n_1}X$,

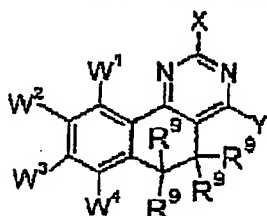
wherein n_1 is an integer of 1 to 5 and X is $-O-(CH_2)_{m_1}CH_3$, $-OC(O)-(CH_2)_{m_1}CH_3$, $-C(O)-O-C_1-C_8$ alkyl, $-NR^{103}R^{104}$, wherein m_1 is an integer of 0 to 5 and R^{103} and R^{104} are independently of each other H, or C_1-C_8 alkyl, or R^{103} and R^{104} together form a five or six membered

heterocyclic ring, in particular

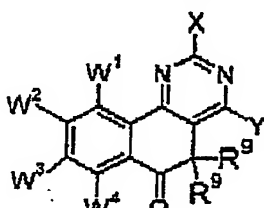




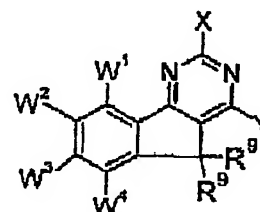
wherein V, W¹ to W⁶, X, Y¹ to Y⁶ are as defined above, wherein V is preferably with the proviso that at least one substituent V¹ to V⁶ is different from hydrogen;



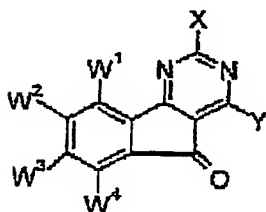
(XIVa),



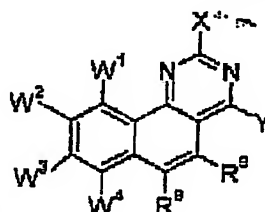
(XIVb),



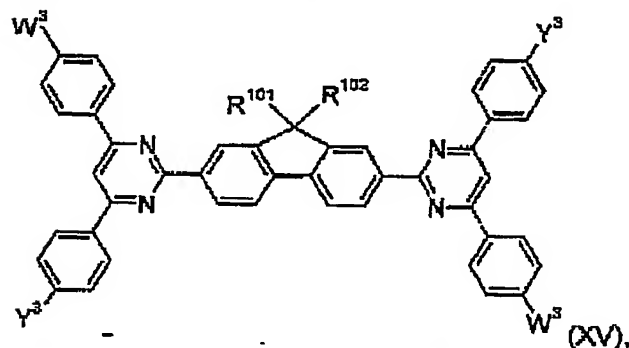
(XIVc),



(XIVd), or



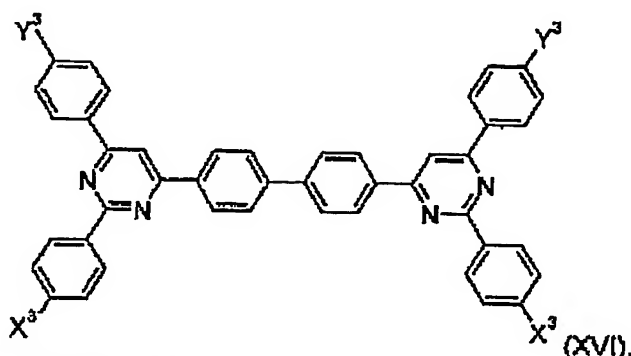
(XIVe), wherein X, Y, W¹ to W⁶, and R⁹ are as defined above.



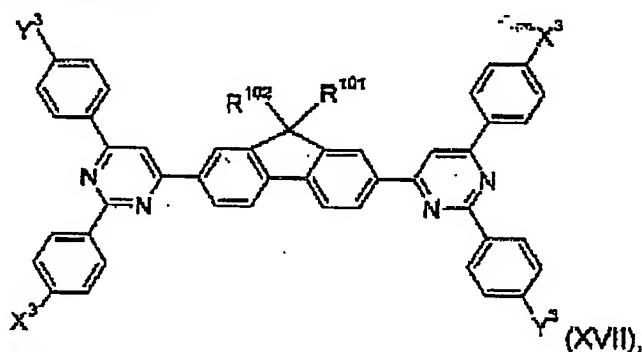
(XV),

wherein W³ is H, -NR¹⁰³R¹⁰⁴, C₁-C₈thioalkyl, or C₁-C₈alkoxy, Y³ is H, -NR¹⁰³R¹⁰⁴, C₁-C₈thioalkyl, or C₁-C₈alkoxy, wherein R¹⁰³ and R¹⁰⁴ are independently of each other H, or C₁-C₈alkyl, R¹⁰¹ and R¹⁰² are independently of each other H, C₁-C₈alkyl, phenyl, or C₅-C₇cycloalkyl, in particular cyclohexyl;

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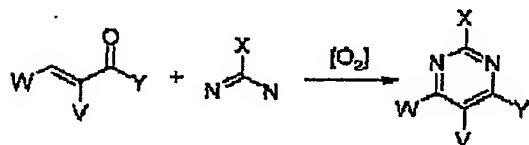
wherein Y^3 is H, $-NR^{103}R^{104}$, C_1-C_8 thioalkyl, or C_1-C_8 alkoxy,
 X^3 is H, $-NR^{103}R^{104}$, C_1-C_8 thioalkyl, or C_1-C_8 alkoxy, wherein R^{103} and R^{104} are independently of each other H, or C_1-C_8 alkyl;



Y^3 is H, $-NR^{103}R^{104}$, C_1-C_8 thioalkyl, or C_1-C_8 alkoxy,
 X^3 is H, $-NR^{103}R^{104}$, C_1-C_8 thioalkyl, or C_1-C_8 alkoxy, wherein R^{103} and R^{104} are independently of each other H, or C_1-C_8 alkyl, R^{101} and R^{102} are independently of each other H, C_1-C_8 alkyl, phenyl, or C_5-C_7 cycloalkyl, in particular cyclohexyl;

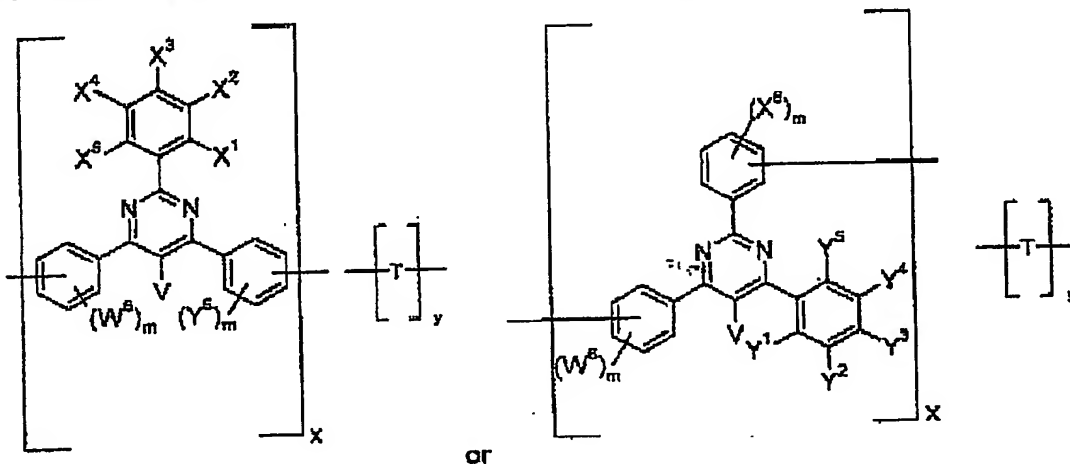
The present pyrimidine compounds are known or can be prepared according to or analogous to known procedures. The present pyrimidine compounds are for instance derivatives of known hydroxyphenyl pyrimidine compounds: US-A-3,442,898, US-A-5,597,854 and US-A-5,753,729, the relevant parts of which are hereby incorporated by reference. The present pyrimidine compounds can for instance be prepared according to or analogous to the following procedures:

Suzuki aryl-aryl cross coupling reaction (Chem. Commun., 2002, 874 – 875); DE-A-3001188, J. Org. Chem. Vol. 36, 1971, 3382-3385:

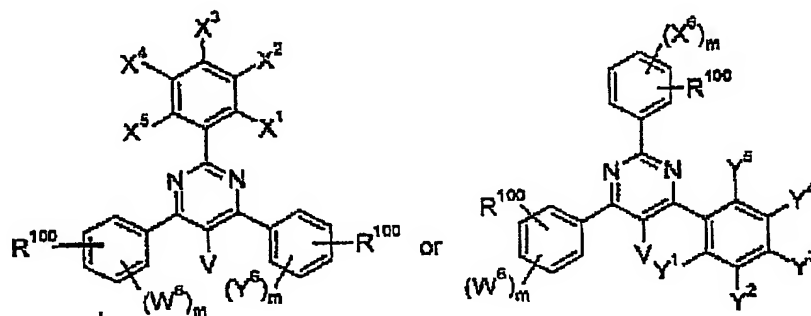


An amidine hydrochloride is added to a 2-propen-1-one derivative in a C₁-C₄-alcohol, like methanol, ethanol, propanol or butanol. A base, for example, an alkali metal hydroxide or alkoxide, such as sodium methoxide or potassium hydroxide is added and the solution is stirred in the presence of oxygen, for example dry air.

The polymers of the present invention, comprising the following units:

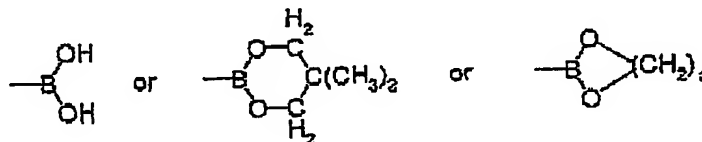


can be prepared according to a process, which comprises reacting a DPP derivative of formula



wherein X¹ to X⁵, X⁶, V, W⁶, Y⁶, Y¹ to Y⁵, m, x and y are as defined above, x is chosen in the range of from 0.005 to 1, preferably from 0.01 to 1, and y from 0.995 to 0, preferably 0.99 to 0, and wherein x + y = 1,

R¹⁰⁰ stands for halogen such as chloro or bromo, preferably bromo, or E having the meaning of



wherein a is 2 or 3,

with boronic acid derivative

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E-T-E,

or --in case R^{100} is not halogen --

Hal-T-Hal,

wherein Hal stands for halogen, preferably for bromo,

wherein T is C_6 - C_{24} -aryl or C_5 - C_{24} -heteroaryl, which can be substituted (see for example US-A-6,451,459 or DE-A-19651439).

Preferably, the reaction is carried out in the presence of an organic solvent, such as an aromatic hydrocarbon or a usual polar organic solvent, such as benzene, toluene, xylene, tetrahydrofuran, or dioxane, or mixtures thereof, most preferred toluene. Usually, the amount of the solvent is chosen in the range of from 1 to 10 l per mol of boronic acid derivative. Also preferred, the reaction is carried out under an inert atmosphere such as nitrogen, or argon.

Further, it is preferred to carry out the reaction in the presence of an aqueous base, such as an alkali metal hydroxide or carbonate such as NaOH, KOH, Na_2CO_3 , K_2CO_3 , Cs_2CO_3 and the like, preferably an aqueous K_2CO_3 solution is chosen. Usually, the molar ratio of the base to compound III is chosen in the range of from 0.5:1 to 50:1.

Generally, the reaction temperature is chosen in the range of from 40 to 180°C, preferably under reflux conditions.

Preferred, the reaction time is chosen in the range of from 1 to 80 hours, more preferably from 20 to 72 hours.

In a preferred embodiment a usual catalyst for coupling reactions or for polycondensation reactions is used, preferably Pd-based catalyst such as known tetrakis(triarylphosphonium)-palladium, preferably $(Ph_3P)_4Pd$ and derivatives thereof. Usually, the catalyst is added in a molar ratio from inventive DPP polymer to the catalyst in the range of from 100:1 to 10:1, preferably from 50:1 to 30:1.

Also preferred, the catalyst is added as in solution or suspension. Preferably, an appropriate organic solvent such as the ones described above, preferably benzene, toluene, xylene, THF, dioxane, more preferably toluene, or mixtures thereof, is used. The amount of solvent usually is chosen in the range of from 1 to 10 l per mol of boronic acid derivative.

The obtained inventive polymer can be isolated by well-known methods. Preferably, after cooling down the reaction mixture to room temperature, it is poured into acetone and the obtained precipitation is filtered off, washed and dried.

C_1 - C_{18} alkyl is a branched or unbranched radical such as for example methyl, ethyl, propyl, isopropyl, n-butyl, sec-butyl, isobutyl, tert-butyl, 2-ethylbutyl, n-pentyl, isopentyl, 1-methylpentyl, 1,3-dimethylbutyl, n-hexyl, 1-methylhexyl, n-heptyl, isoheptyl, 1,1,3,3-

tetramethylbutyl, 1-methylheptyl, 3-methylheptyl, n-octyl, 2-ethylhexyl, 1,1,3-trimethylhexyl, 1,1,3,3-tetramethylpentyl, nonyl, decyl, undecyl, 1-methylundecyl, dodecyl, 1,1,3,3,5,5-hexamethylhexyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, or octadecyl.

C₁-C₁₈Alkoxy radicals are straight-chain or branched alkoxy radicals, e.g. methoxy, ethoxy, n-propoxy, isopropoxy, n-butoxy, sec-butoxy, tert-butoxy, amyloxy, isoamyloxy or tert-amyloxy, heptyloxy, octyloxy, isooctyloxy, nonyloxy, decyloxy, undecyloxy, dodecyloxy, tetradecyloxy, pentadecyloxy, hexadecyloxy, heptadecyloxy and octadecyloxy.

C₂-C₁₈Alkenyl radicals are straight-chain or branched alkenyl radicals, such as e.g. vinyl, allyl, methallyl, isopropenyl, 2-butenyl, 3-butenyl, isobutenyl, n-penta-2,4-dienyl, 3-methyl-but-2-enyl, n-oct-2-enyl, n-dodec-2-enyl, isododecenyl, n-dodec-2-enyl or n-octadec-4-enyl.

C₂₋₂₄Alkynyl is straight-chain or branched and preferably C₂₋₈alkynyl, which may be unsubstituted or substituted, such as, for example, ethynyl, 1-propyn-3-yl, 1-butyne-4-yl, 1-pentyne-5-yl, 2-methyl-3-butyne-2-yl, 1,4-pentadiyne-3-yl, 1,3-pentadiyne-5-yl, 1-hexyne-6-yl, cis-3-methyl-2-penten-4-yn-1-yl, trans-3-methyl-2-penten-4-yn-1-yl, 1,3-hexadiyne-5-yl, 1-octyne-8-yl, 1-nonyne-9-yl, 1-decyn-10-yl or 1-tetracosyn-24-yl.

C₄-C₁₈cycloalkyl is preferably C₅-C₁₂cycloalkyl, such as, for example, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclononyl, cyclodecyl, cyclododecyl. Cyclohexyl and cyclododecyl are most preferred.

C₂-C₁₈alkenyl is for example vinyl, allyl, butenyl, pentenyl, hexenyl, heptenyl, or octenyl.

C₆-C₂₄aryl radicals are preferably C₆-C₁₄aryl radicals, such as, for example, phenyl, 4-methylphenyl, 4-methoxyphenyl, naphthyl, biphenyl, 2-fluorenyl, phenanthryl, anthryl or terphenyl, which can be substituted or unsubstituted.

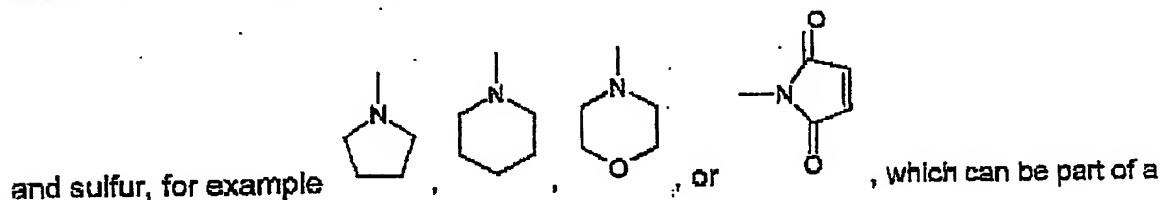
C₇-C₂₄aralkyl radicals are preferably C₇-C₁₅aralkyl radicals, which may be substituted, such as, for example, benzyl, 2-benzyl-2-propyl, β-phenethyl, α,α-dimethylbenzyl, ω-phenyl-butyl, ω-phenyl-octyl, ω-phenyl-dodecyl or 3-methyl-5-(1',1',3',3'-tetramethyl-butyl)-benzyl.

C₈₋₂₄aryl heteroaryl is a ring with five to seven ring atoms, wherein nitrogen, oxygen or sulfur are the possible hetero atoms, and is typically an unsaturated heterocyclic radical with five to 24 atoms having at least six conjugated π-electrons such as thienyl, benzo[b]thienyl.

dibenzo[b,d]thienyl, thianthrenyl, furyl, furfuryl, 2H-pyranyl, benzofuranyl, isobenzofuranyl, dibenzofuranyl, phenoxythienyl, pyrrolyl, imidazolyl, pyrazolyl, pyridyl, bipyridyl, triazinyl, pyrimidinyl, pyrazinyl, pyridazinyl, indolizynyl, isoindolyl, indolyl, indazolyl, purinyl, quinolizynyl, chinolyl, isochinolyl, phthalazinyl, naphthyridinyl, chinoxalynyl, chinazolynyl, cinnolynyl, pteridinyl, carbazolyl, carbolinyl, benzotriazolyl, benzoxazolyl, phenanthridinyl, acridinyl, perimidinyl, phenanthrolinyl, phenazinyl, isothiazolyl, phenothiazinyl, isoxazolyl, furazanyl or phenoxazinyl, which can be unsubstituted or substituted.

Halogen is fluorine, chlorine, bromine and iodine.

Examples of a five or six membered ring formed by R^5 and R^6 and R^{103} and R^{104} , respectively are heterocycloalkanes or heterocycloalkenes having from 3 to 5 carbon atoms which can have one additional hetero atom selected from nitrogen, oxygen



bicyclic system, for example

Possible substituents of the above-mentioned groups are C_1 - C_8 alkyl, a hydroxyl group, a mercapto group, C_1 - C_8 alkoxy, C_1 - C_8 alkylthio, halogen, halo- C_1 - C_8 alkyl, a cyano group, an aldehyde group, a ketone group, a carboxyl group, an ester group, a carbamoyl group, an amino group, a nitro group or a silyl group.

As described above, the aforementioned radicals may be substituted by E and/or, if desired, interrupted by D. Interruptions are of course possible only in the case of radicals containing at least 2 carbon atoms connected to one another by single bonds; C_6 - C_{10} aryl is not interrupted; interrupted arylalkyl or alkylaryl contains the unit D in the alkyl moiety. C_1 - C_{10} alkyl substituted by one or more E and/or interrupted by one or more units D is, for example, $(CH_2CH_2O)_n-R^x$, where n is a number from the range 1-9 and R^x is H or C_1 - C_{10} alkyl or C_2 - C_{10} alkanoyl (e.g. $CO-CH(C_2H_5)C_4H_9$), $CH_2-CH(OR^y)-CH_2-O-R^y$, where R^y is C_1 - C_{10} alkyl.

C_5-C_{12} cycloalkyl, phenyl, C_7-C_{15} phenylalkyl, and R^h embraces the same definitions as R^y or is H;

C_1-C_8 alkylene-COO- R^z , e.g. $CH_2COOR_zCH(CH_3)COOR^z$, $C(CH_3)_2COOR^z$, where R^z is H, C_1-C_{18} alkyl, $(CH_2CH_2O)_{1-9}-R^x$, and R^x embraces the definitions indicated above;
 $CH_2CH_2-O-CO-CH=CH_2$; $CH_2CH(OH)CH_2-O-CO-C(CH_3)=CH_2$.

To obtain organic layers of this invention with the proper T_g , or glass transition temperature, it is advantageous that the present organic compounds have a melting point greater than about $150^\circ C$, for example greater than about $200^\circ C$, for example greater than about $250^\circ C$, for instance greater than about $300^\circ C$.

The electroluminescent devices of the present invention are otherwise designed as is known in the art, for example as described in U.S. Pat. Nos. 5,518,824, 6,280,859, 5,629,389, 5,486,406, 5,104,740 and 5,116,708, the relevant disclosures of which are hereby incorporated by reference.

For example, organic EL devices contain one or more layers such as:

substrate; base electrode; hole-injecting layer; hole-transporting layer; emitter layer; electron-transporting layer; electron-injecting layer; top electrode; contacts and encapsulation.

This structure is a general case and may have additional layers or may be simplified by omitting layers so that one layer performs a plurality of tasks. For instance, the simplest organic EL device consists of two electrodes which sandwich an organic layer that performs all functions, including the function of light emission.

In particular, the present organic compounds function as light emitters and are contained in the light emission layer.

The light emitting compounds of this invention exhibit intense fluorescence in the solid state and have excellent electric-field-applied light emission characteristics. Further, the light emitting compounds of this invention are excellent in the injection of holes from a metal electrode and the transportation of holes; as well as being excellent in the injection of electrons from a metal electrode and the transportation of electrons. They are effectively used as light emitting materials and may be used in combination with other hole transporting materials, other electron transporting materials or other dopants.

The organic compounds of the present invention form uniform thin films. The light emitting layers may therefore be formed of the present organic compounds alone.

Alternatively, the light-emitting layer may contain a known light-emitting material, a known dopant, a known hole-injecting material or a known electron-injecting material as required. In the organic EL device, a decrease in the brightness and life caused by quenching can be

prevented by forming it as a multi-layered structure. The light-emitting material, a dopant, a hole-injecting material and an electron-injecting material may be used in combination as required. Further, a dopant can improve the light emission brightness and the light emission efficiency, and can attain the red or blue light emission. Further, each of the hole-injecting zone, the light-emitting layer and the electron-injecting zone may have the layer structure of at least two layers. In the hole-injecting zone in this case, a layer to which holes are injected from an electrode is called "hole-injecting layer", and a layer which receives holes from the hole-injecting layer and transport the holes to a light-emitting layer is called "hole-transporting layer". In the electron-injecting zone, a layer to which electrons are injected from an electrode is called "electron-injecting layer", and a layer which receives electrons from the electron-injecting layer and transports the electrons to a light-emitting layer is called "electron-transporting layer". These layers are selected and used depending upon factors such as the energy level and heat resistance of materials and adhesion to an organic layer or metal electrode.

The light-emitting material or the dopant which may be used in the light-emitting layer together with the organic compounds of the present invention includes for example anthracene, naphthalene, phenanthrene, pyrene, tetracene, coronene, chrysene, fluorescein, perylene, phthaloperylene, naphthaloperylene, perinone, phthaoperinone, naphthaloperinone, diphenylbutadiene, tetraphenylbutadiene, coumarine, oxadiazole, aldzine, bisbenzoxazoline, bisstyryl, pyrazine, cyclopentadiene, quinoline metal complex, aminoquinoline metal complex, benzoquinoline metal complex, imine, diphenylethylene, vinyl anthracene, diaminocarbazole, pyran, thiopyran, polymethine, merocyanine, an imidazole-chelated oxynoid compound, quinacridone, rubrene, and fluorescent dyestuffs for a dyestuff laser or for brightening.

The organic compounds of the present invention and the above compound or compounds that can be used in a light-emitting layer may be used in any mixing ratio for forming a light-emitting layer. That is, the organic compounds of the present invention may provide a main component for forming a light-emitting layer, or they may be a doping material in another main material, depending upon a combination of the above compounds with the organic compounds of the present invention.

The hole-injecting material is selected from compounds which are capable of transporting holes, are capable of receiving holes from the anode, have an excellent effect of injecting holes to a light-emitting layer or a light-emitting material, prevent the movement of excitons generated in a light-emitting layer to an electron-injecting zone or an electron-injecting material and have the excellent capability of forming a thin film. Suitable hole-injecting materials include for example a phthalocyanine derivative, a naphthalocyanine derivative, a

porphyrin derivative, oxazole, oxadiazole, triazole, imidazole, imidazolone, imidazolthione, pyrazoline, pyrazolone, tetrahydroimidazole, oxazole, oxadiazole, hydrazone, acylhydrazone, polyaryalkane, stilbene, butadiene, benzidine type triphenylamine, styrylamine type triphenylamine, diamine type triphenylamine, derivatives of these, and polymer materials such as polyvinylcarbazole, polysilane and an electroconducting polymer.

In the organic EL device of the present invention, the hole-injecting material which is more effective is an aromatic tertiary amine derivative or a phthalocyanine derivative. Although not specially limited, specific examples of the tertiary amine derivative include triphenylamine, tritolylamine, tolyldiphenylamine, N,N'-diphenyl-N,N'-(3-methylphenyl)-1,1'-biphenyl-4,4'-diamine, N,N,N',N'-tetra(4-methylphenyl)-1,1'-phenyl-4,4'-diamine, N,N,N',N'-tetra(4-methylphenyl)-1,1'-biphenyl-4,4'-diamine, N,N'-diphenyl-N,N'-di(1-naphthyl)-1,1'-biphenyl-4,4'-diamine, N,N'-di(methylphenyl)-N,N'-di(4-n-butylphenyl)-phenanthrene-9,10-diamine, 4,4',4''-tris(3-methylphenyl)-N-phenylamino(triphenylamine, 1,1-bis(4-di-p-tolylaminophenyl)cyclohexane, and oligOMers or polymers having aromatic tertiary amine structures of these.

Although not specially limited, specific examples of the phthalocyanine (Pc) derivative include phthalocyanine derivatives or naphthalocyanine derivatives such as H₂Pc, CuPc, CoPc, NiPc, ZnPc, PdPc, FePc, MnPc, ClAlPc, ClGaPc, ClInPc, ClSnPc, Cl.sub.2-SiPc, (HO)AlPc, (HO)GaPc, VO₂Pc, TiOPc, MoOPc, and GaPc-O-GaPc.

The electron-injecting material is a material which is capable of transporting electrons, receiving electrons from a cathode, injecting electrons into a light-emitting layer or light-emitting material, preventing excitons generated in the light-emitting layer from moving into a hole-injecting zone and forming a thin film. Although not specially limited, examples of the electron-injecting material include fluorenone, anthraquinodimethane, diphenylquinone, thiopyran dioxide, oxazole, oxadiazole, triazole, imidazole, perylenetetracarboxylic acid, fluorenylidene methane, anthrone and derivatives of these. The hole-injecting material may be sensitivity-increased by incorporating an electron-accepting material, and the electron-injecting material may be sensitivity-increased by incorporating an electron-donating material.

In the organic EL device of the present invention, the electron-injecting material which is for example a metal complex compound or a nitrogen-containing five-membered derivative. Although not specially limited, specific examples of the metal complex compound include lithium 8-hydroxyquinolate, zinc bis(8-hydroxyquinolate), copper bis(8-hydroxyquinolate), manganese bis(8-hydroxyquinolate), aluminum tris(8-hydroxyquinolate), aluminum tris(2-methyl-8-hydroxyquinolate), gallium tris(8-hydroxyquinolate), beryllium bis(10-hydroxybenzo[h]quinolate), zinc bis(10-

hydroxybenzo[h]quinolate), chlorogallium bis(2-methyl-8-quinolate), gallium bis(2-methyl-8-quinolate)(o-cresolate), aluminum bis(2-methyl-8-quinolate)(1-naphtholate), gallium bis(2-methyl-8-quinolate)(2-naphtholate), gallium bis(2-methyl-8-quinolate)phenolate, zinc bis(o-(2-benzoxazolyl)phenolate), zinc bis(o-(2-benzothiazolyl)phenolate) and zinc bis(o-(2-benzotriazolyl)phenolate). The nitrogen-containing five-membered derivative is preferably an oxazole, thiazole, thiadiazole, or triazole derivative. Although not specially limited, specific examples of the above nitrogen-containing five-membered derivative include 2,5-bis(1-phenyl)-1,3,4-oxazole, 1,4-bis(2-(4-methyl-5-phenyloxazolyl)benzene, 2,5-bis(1-phenyl)-1,3,4-thiazole; 2,5-bis(1-phenyl)-1,3,4-oxadiazole, 2-(4'-tert-butylphenyl)-5-(4"-biphenyl)1,3,4-oxadiazole, 2,5-bis(1-naphthyl)-1,3,4-oxadiazole, 1,4-bis[2-(5-phenyloxadiazolyl)]benzene, 1,4-bis[2-(5-phenyloxadiazolyl)-4-tert-butylbenzene], 2-(4'-tert-butylphenyl)-5-(4"-biphenyl)-1,3,4-thiadiazole, 2,5-bis(1-naphthyl)-1,3,4-thiadiazole, 1,4-bis[2-(5-phenylthiazolyl)]benzene, 2-(4'-tert-butylphenyl)-5-(4"-biphenyl)-1,3,4-triazole, 2,5-bis(1-naphthyl)-1,3,4-triazole and 1,4-bis[2-(5-phenyltriazolyl)]benzene.

In the organic EL device of the present invention, the light-emitting layer may contain, in addition to the light-emitting organic material of the present invention, at least one of other light-emitting material, other dopant, other hole-injecting material and other electron-injecting material. For improving the organic EL device of the present invention in the stability against temperature, humidity and ambient atmosphere, a protective layer may be formed on the surface of the device, or the device as a whole may be sealed with a silicone oil, or the like. The electrically conductive material used for the anode of the organic EL device is suitably selected from those materials having a work function of greater than 4 eV. The electrically conductive material includes carbon, aluminum, vanadium, iron, cobalt, nickel, tungsten, silver, gold, platinum, palladium, alloys of these, metal oxides such as tin oxide and indium oxide used for ITO substrates or NESA substrates, and organic electroconducting polymers such as polythiophene and polypyrrole.

The electrically conductive material used for the cathode is suitably selected from those having a work function of smaller than 4 eV. The electrically conductive material includes magnesium, calcium, tin, lead, titanium, yttrium, lithium, ruthenium, manganese, aluminum and alloys of these, while the electrically conductive material shall not be limited to these. ~~Examples~~ of the alloys include magnesium/silver, magnesium/indium and lithium/aluminum, ~~etc.~~ the alloys shall not be limited to these. Each of the anode and the cathode may have a layer structure formed of two layers or more as required.

For the effective light emission of the organic EL device, at least one of the electrodes is desirably sufficiently transparent in the light emission wavelength region of the device. Further, the substrate is desirably transparent as well. The transparent electrode is

produced from the above electrically conductive material by a deposition method or a sputtering method such that a predetermined light transmittance is secured. The electrode on the light emission surface side has for instance a light transmittance of at least 10%. The substrate is not specially limited so long as it has adequate mechanical and thermal strength and has transparency. For example, it is selected from glass substrates and substrates of transparent resins such as a polyethylene substrate, a polyethylene terephthalate substrate, a polyether sulfone substrate and a polypropylene substrate.

In the organic EL device of the present invention, each layer can be formed by any one of dry film forming methods such as a vacuum deposition method, a sputtering method, a plasma method and an ion plating method and wet film forming methods such as a spin coating method, a dipping method and a flow coating method. The thickness of each layer is not specially limited, while each layer is required to have a proper thickness. When the layer thickness is too large, inefficiently, a high voltage is required to achieve predetermined emission of light. When the layer thickness is too small, the layer is liable to have a pinhole, etc., so that sufficient light emission brightness is hard to obtain when an electric field is applied. The thickness of each layer is for example in the range of from about 5 nm to about 10 μm , for instance about 10 nm to about 0.2 μm .

In the wet film forming method, a material for forming an intended layer is dissolved or dispersed in a proper solvent such as ethanol, chloroform, tetrahydrofuran and dioxane, and a thin film is formed from the solution or dispersion. The solvent shall not be limited to the above solvents. For improving the film formability and preventing the occurrence of pinholes in any layer, the above solution or dispersion for forming the layer may contain a proper resin and a proper additive. The resin that can be used includes insulating resins such as polystyrene, polycarbonate, polyarylate, polyester, polyamide, polyurethane, polysulfone, polymethyl methacrylate, polymethyl acrylate and cellulose, copolymers of these, photoconductive resins such as poly-N-vinylcarbazole and polysilane, and electroconducting polymers such as polythiophene and polypyrrole. The above additive includes an antioxidant, an ultraviolet absorbent and a plasticizer.

When the light-emitting organic material of the present invention is used in a light-emitting layer of an organic EL device, an organic EL device can be improved in organic EL device characteristics such as light emission efficiency and maximum light emission brightness. Further, the organic EL device of the present invention is remarkably stable against heat and electric current and gives a usable light emission brightness at a low actuation voltage. The problematic deterioration of conventional devices can be remarkably decreased.

The organic EL device of the present invention has significant industrial values since it can be adapted for a flat panel display of an on-wall television set, a flat light-emitting device, a

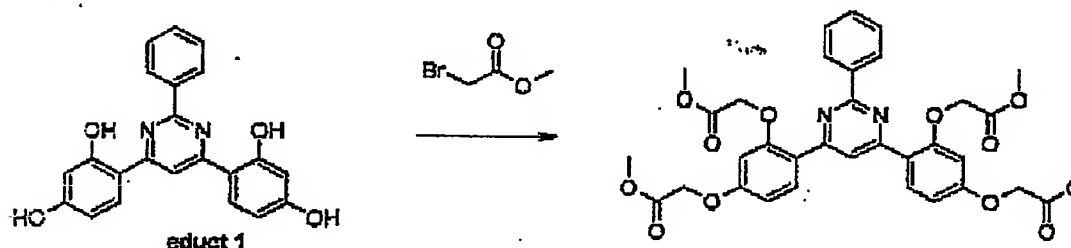
light source for a copying machine or a printer, a light source for a liquid crystal display or counter, a display signboard and a signal light.

The material of the present invention can be used in the fields of an organic EL device, an electrophotographic photoreceptor, a photoelectric converter, a solar cell, an image sensor, and the like.

The following Examples illustrate the invention. In the Examples and throughout this application, the term light emitting material means the present pyrimidine compounds.

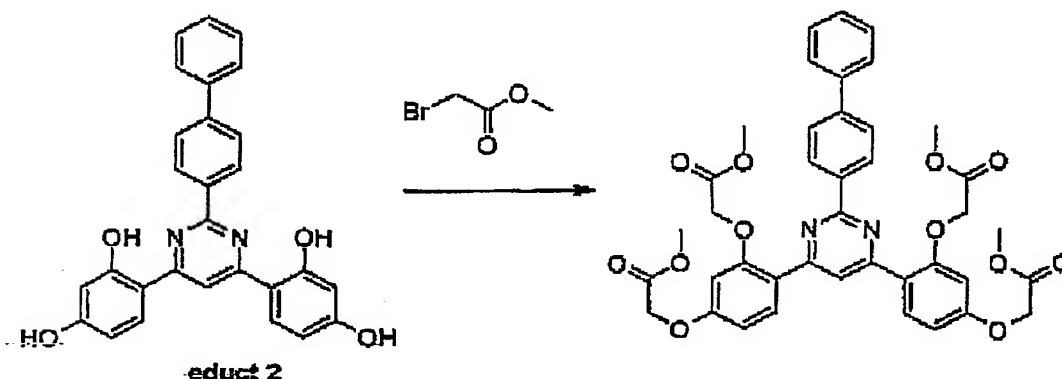
Examples

Example 1 (A-1)



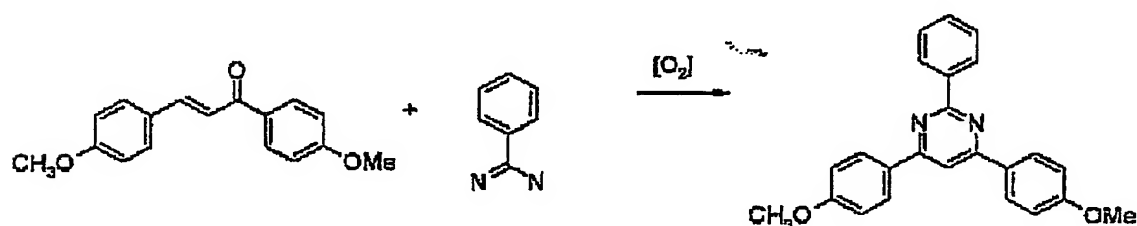
To 1.00 g (2.69 mmol) of educt 1 (prepared according to US-A-3,442,898 from resorcinol and 4,6-dichloro-2-phenyl-pyrimidine; J. Org. Chem. 1968, 53, 4137) in 20 ml water free DMF 3.29 g (21.5 mmol) methyl-bromoacetate and 2.97 g (21.5 mmol) potassium carbonate are added. The reaction mixture is stirred at 100 °C under nitrogen for 2 h. The reaction mixture is diluted with water. The organic phase is extracted with dichloromethane und dried with magnesium sulfate. The solvent is removed. After chromatography of the crude product on silica gel with toluene / ethyl acetate 8/2 the desired product is obtained. Melting point: 178.0 – 179.0 °C.

Example 2 (A-2)



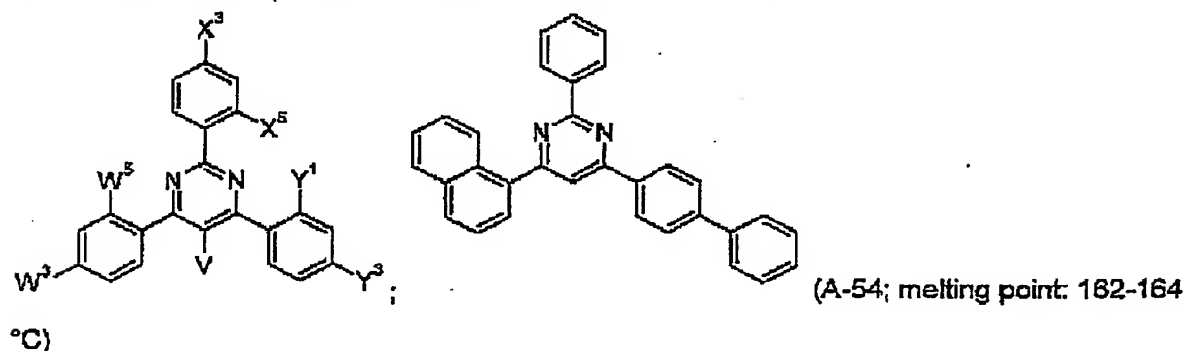
To 520 mg (1.16 mmol) of educt 2 (prepared according to US-A-3,442,898 from resorcinol and 4,6-dichloro-2-biphenyl-pyrimidine; EP-A-96657) in 20 ml water free DMF 1.42 g (9.28 mmol) methyl-bromoacetate and 1.28 g (9.28 mmol) potassium carbonate are added. The reaction mixture is stirred at 100 °C under nitrogen for 2 h. The reaction mixture is diluted with water. The organic phase is extracted with dichloromethane und dried with magnesium sulfate. The solvent is removed. After chromatography of the crude product on silica gel with toluene / ethyl acetate 9/1 and later 7/3 the desired product is obtained. Melting point: 119.5 – 121.5 °C.

Example 3 (A-3)



To 4.31 g (16.1 mmol) of 1,3-bis(4-methoxyphenyl)-2-propen-1-one in 25 ml water free ethanol 1.89 g (8.11 mmol) biphenylbenzamidinium hydrochlorid are added. A solution of 1.07 g (19.08 mmol) potassium hydroxide is added during 15 min. Dry air is bubbled through the reaction mixture. The reaction mixture is refluxed for 24 h. The reaction mixture is poured into water. The solid is filtered off and washed with water. The product is crystallized 2 times from acetic acid (96-98 %). Melting point: 168-169 °C.

Compounds A-4 to A-54 can be obtained in a manner analogous to Examples 1 to 5.



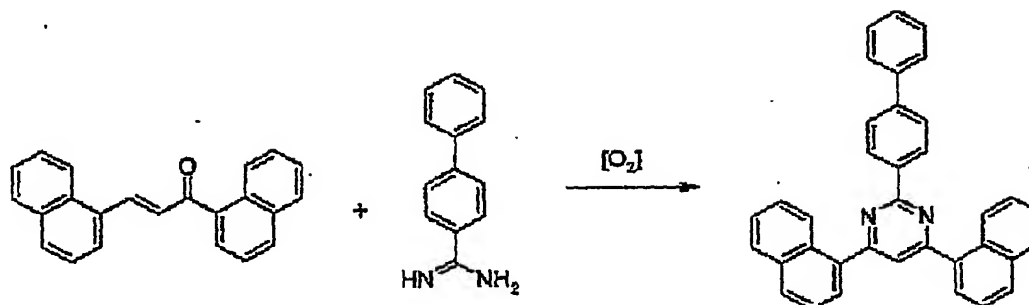
Cpd.	X ¹	Y ¹	W ¹	X ²	Y ²	W ²	V
A-1	H	OCH ₂ COOMe	OCH ₂ COOMe	H	OCH ₂ COOMe	OCH ₂ COOMe	H
A-2	Ph	OCH ₂ COOMe	OCH ₂ COOMe	H	OCH ₂ COOMe	OCH ₂ COOMe	H
A-3	H	OMe	OMe	H	H	H	H
A-4 ^b	H	Ph	Ph	H	H	H	H
A-5	H	OMe	OMe	H	OMe	OMe	H
A-6	H	OBu	OBu	H	H	H	H
A-7	H	OBu	OBu	H	OBu	OBu	H
A-8	OMe	OMe	OMe	OMe	OMe	OMe	H
A-9	OMe	Br	Br	OMe	H	H	H
A-10	Ph	Br	Br	H	H	H	H
A-11	OMe	Ph	Ph	OMe	H	H	H
A-12	Ph	Ph	Ph	H	H	H	H
A-13	SMe	SMe	SMe	H	H	H	H
A-14	H	SMe	SMe	H	H	H	H
A-15	H	OCH ₂ CH ₂ OAc	OCH ₂ CH ₂ OAc	H	H	H	H
A-16	H	OCH ₂ CH ₂ OAc	OCH ₂ CH ₂ OAc	H	OCH ₂ CH ₂ OAc	OCH ₂ CH ₂ OAc	H
A-17	H	OCH ₂ CH ₂ OCH ₂ Et	OCH ₂ CH ₂ OCH ₂ Et	H	H	H	H
A-18	H	OCH ₂ CH ₂ OCH ₂ Et	OCH ₂ CH ₂ OCH ₂ Et	H	OCH ₂ CH ₂ OCH ₂ Et	OCH ₂ CH ₂ OCH ₂ Et	H
A-19	H	N(CH ₃) ₂	N(CH ₃) ₂	H	H	H	H
A-20	H	-N	-N	H	H	H	H
A-21	Ph	N(CH ₃) ₂	N(CH ₃) ₂	H	H	H	H
A-22	Ph	-N	-N	H	H	H	H
A-23	H	CH ₃	CH ₃	H	H	H	H
A-24	Ph	CH ₃	CH ₃	H	H	H	H
A-25	Ph	Ph	Ph	H	H	H	H
A-26	OMe	OMe	OMe	H	H	H	H
A-27	H	Ph	Ph	H	H	H	CH ₃

^b melting point: 244-245°C.

Gpd.	X ¹	Y ²	W ³	X ⁴	Y ¹	W ²	V
A-28	H	OMe	OMe	H	H	H	CH ₃
A-29	H	OMe	OMe	H	OMe	OMe	CH ₃
A-30	H	OBu	OBu	H	H	H	CH ₃
A-31	H	OBu	OBu	H	OBu	OBu	CH ₃
A-32	OMe	OMe	OMe	OMe	OMe	OMe	CH ₃
A-33	OMe	Br	Br	OMe	H	H	CH ₃
A-34	Ph	Br	Br	H	H	H	CH ₃
A-35	OMe	Ph	Ph	OMe	H	H	CH ₃
A-36	H	OCH ₂ COOMe	OCH ₂ COOMe	H	OCH ₂ COOMe	OCH ₂ COOMe	CH ₃
A-37	SMe	SMe	SMe	H	H	H	CH ₃
A-38	H	SMe	SMe	H	H	H	CH ₃
A-39	H	OCH ₂ CH ₂ Oac	OCH ₂ CH ₂ Oac	H	H	H	CH ₃
A-40	H	OCH ₂ CH ₂ Oac	OCH ₂ CH ₂ Oac	H	OCH ₂ CH ₂ Oac	OCH ₂ CH ₂ Oac	CH ₃
A-41	H	OCH ₂ CH ₂ OCH ₂ Et	OCH ₂ CH ₂ OCH ₂ Et	H	H	H	CH ₃
A-42	H	OCH ₂ CH ₂ OCH ₂ Et	OCH ₂ CH ₂ OCH ₂ Et	H	OCH ₂ CH ₂ OCH ₂ Et	OCH ₂ CH ₂ OCH ₂ Et	CH ₃
A-43	OBu	Ph	Ph	OBu	H	H	CH ₃
A-44	H	N(CH ₃) ₂	N(CH ₃) ₂	H	H	H	CH ₃
A-45	H	-N(CH ₃) ₂	-N(CH ₃) ₂	H	H	H	CH ₃
A-46	Ph	N(CH ₃) ₂	N(CH ₃) ₂	H	H	H	CH ₃
A-47	Ph	-N(CH ₃) ₂	-N(CH ₃) ₂	H	H	H	CH ₃
A-48	Ph	CH ₃	CH ₃	H	H	H	CH ₃
A-49	Ph	CH ₃	CH ₃	H	H	H	CH ₃
A-50	OMe	OMe	OMe	H	H	H	H
A-51 ¹⁾	H	H	H	H	H	H	H
A-52 ²⁾	Ph	H	H	H	H	H	H

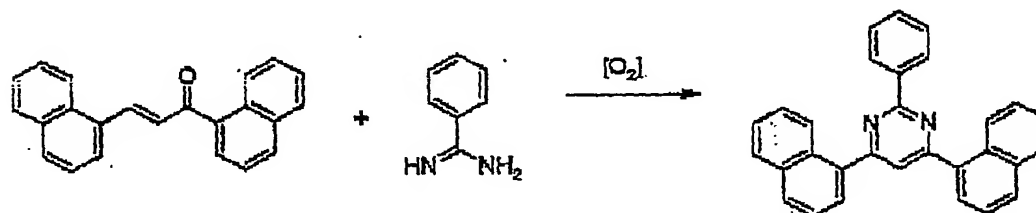
¹⁾ melting point: 188-189°C.²⁾ melting point: 196-198°C.

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Example 4 (B-1)

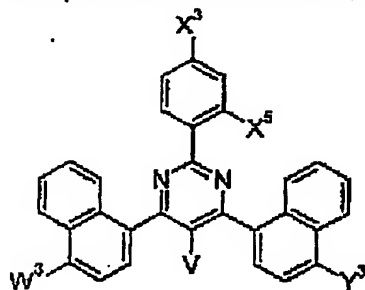
To 5.00 g (16.1 mmol) of 1,3-bis- α -naphthyl-2-propen-1-one (1) in 25 ml water free ethanol 1.89 g (8.11 mmol) biphenylbenzamidinium hydrochloride are added. A solution of 1.07 g (19.08 mmol) potassium hydroxide in 25 ml water free ethanol is added during 15 min. Dry air was bubbled through the reaction mixture. The reaction mixture is refluxed for 24 h.

The reaction mixture is poured into water. The solid is filtered off and is washed with water. The product is crystallized 2 times from acetic acid (96-98 %). Melting point: 226-230 °C.

Example 5 (B-2)

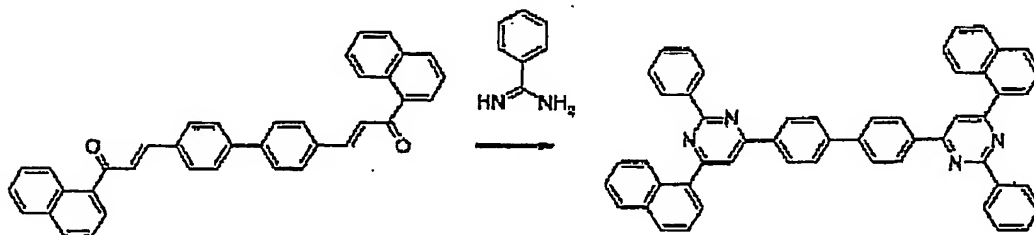
To 5.00 g (16.1 mmol) of 1,3-bis- α -naphthyl-2-propen-1-one (1) in 25 ml water free ethanol 1.27 g (8.11 mmol) benzamidinium hydrochloride are added. A solution of 1.07 g (19.08 mmol) potassium hydroxide in 25 ml water free ethanol is added during 15 min. Dry air is bubbled through the reaction mixture. The reaction mixture is refluxed for 24 h. The reaction mixture is poured into water. The solid is filtered off and is washed with water. The product is crystallized from acetic acid (96-98 %). Melting point: 179-180 °C.

Compounds B-3 to B-23 can be obtained in a manner analogous to Examples 4 and 5.



Cpd.	X^3	Y^3	W^3	X^5	V
B-1	Ph	H	H	H	H
B-2	H	H	H	H	H
B-3	OBu	H	H	OBu	H
B-4	OMe	H	H	OMe	H
B-5	OCH_2COOMe	H	H	OCH_2COOMe	H
B-6	H	OMe	OMe	H	H
B-7	$OCH_2CH_2OCH_2Et$	H	H	$OCH_2CH_2OCH_2Et$	H
B-8	OCH_2CH_2OAc	H	H	OCH_2CH_2OAc	H
B-9	OMe	OMe	OMe	OMe	H
B-10	OMe	OMe	OMe	OMe	H
B-11	H	CH_3	CH_3	H	H
B-12	Ph	CH_3	CH_3	H	H
B-13	Ph	H	H	H	CH_3
B-14	OMe	H	H	OMe	CH_3
B-15	OBu	H	H	OBu	CH_3
B-16	H	H	H	H	CH_3
B-17	OCH_2COOMe	H	H	OCH_2COOMe	CH_3
B-18	H	OMe	OMe	H	CH_3
B-19	$OCH_2CH_2OCH_2Et$	H	H	$OCH_2CH_2OCH_2Et$	CH_3
B-20	OCH_2CH_2OAc	H	H	OCH_2CH_2OAc	CH_3
B-21	H	CH_3	CH_3	H	CH_3
B-22	Ph	CH_3	CH_3	H	CH_3

Example 6 (C-1)

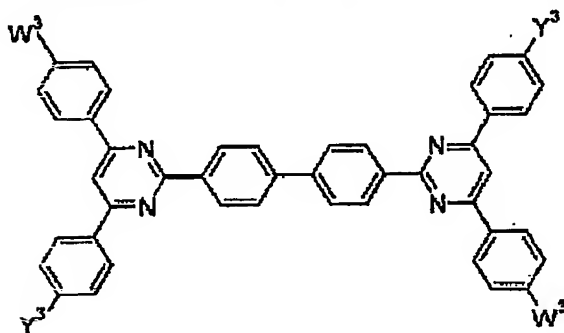


To 4.50 g (8.74 mmol) of the 2-propen-1-one derivative shown above in 50 ml water free ethanol 1.37 g (8.74 mmol) benzamidine hydrochloride are added. A solution of 1.15 g (20.6 mmol) potassium hydroxide in 50 ml water free ethanol is added during 15 min. Dry air is bubbled through the reaction mixture. The reaction mixture is refluxed for 24 h, poured into

water and the water phase is extracted with dichloromethane. The organic phase is dried with magnesium sulfate, the solvent is removed by distillation and the remaining residue is purified by column chromatography (toluene / hexane 2/1).

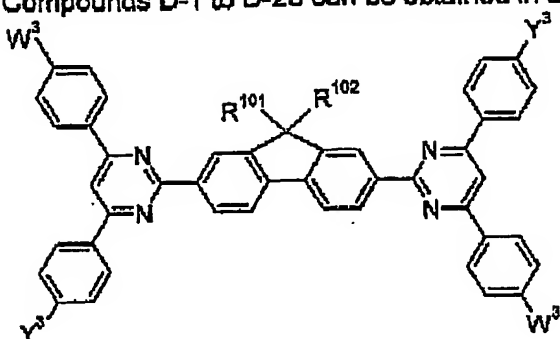
¹H-NMR (300 MHz, CDCl₃): δ= 8.75-8.72 (m, 4H); 8.45-8.37 (m, 12H); 8.04-7.82 (m, 6H); 7.67-7.50 (m, 12h).

Compounds C-2 to C-24 can be obtained in a manner analogous to Example 6.



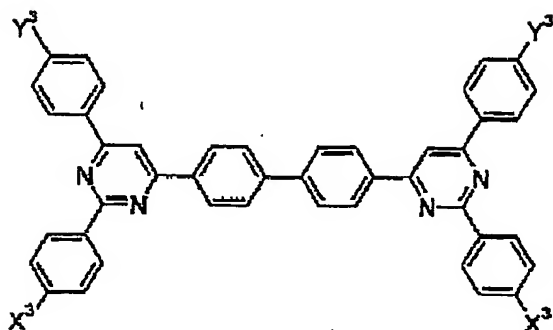
Cpd.	W ³	Y ³
C-2	H	H
C-3	H	H
C-4	H	H
C-5	H	H
C-6	H	H
C-7	OCH ₃	OCH ₃
C-8	OCH ₃	OCH ₃
C-9	OCH ₃	OCH ₃
C-10	OCH ₃	OCH ₃
C-11	OCH ₃	OCH ₃
C-12	SCH ₃	SCH ₃
C-13	SCH ₃	SCH ₃
C-14	SCH ₃	SCH ₃
C-15	SCH ₃	SCH ₃
C-16	SCH ₃	SCH ₃
C-17	SCH ₃	SCH ₃
C-18	N(CH ₃) ₂	N(CH ₃) ₂
C-19	N(CH ₃) ₂	N(CH ₃) ₂
C-20	N(CH ₃) ₂	N(CH ₃) ₂
C-21	N(CH ₃) ₂	N(CH ₃) ₂
C-22	N(CH ₃) ₂	N(CH ₃) ₂
C-23	N(CH ₃) ₂	N(CH ₃) ₂
C-24	N(CH ₃) ₂	N(CH ₃) ₂

Compounds D-1 to D-23 can be obtained in a manner analogous to Example 6.



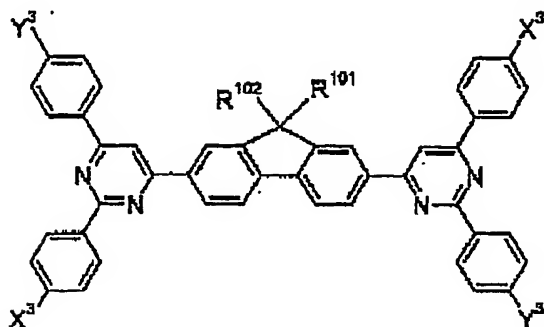
Cpd.	R ¹⁰¹	R ¹⁰²	W ³	Y ³
D-1	C ₆ H ₁₃	C ₆ H ₁₃	H	H
D-2	Bu	Bu	H	H
D-3	Et	Et	H	H
D-4	H	H	H	H
D-5	Ph	Ph	H	H
D-6	C ₆ H ₁₃	C ₆ H ₁₃	OCH ₃	OCH ₃
D-7	Bu	Bu	OCH ₃	OCH ₃
D-8	Et	Et	OCH ₃	OCH ₃
D-9	H	H	OCH ₃	OCH ₃
D-10	Ph	Ph	OCH ₃	OCH ₃
D-11	C ₆ H ₁₃	C ₆ H ₁₃	SCH ₃	SCH ₃
D-12	Bu	Bu	SCH ₃	SCH ₃
D-13	Et	Et	SCH ₃	SCH ₃
D-14	H	H	SCH ₃	SCH ₃
D-15	Ph	Ph	SCH ₃	SCH ₃
D-16	C ₆ H ₁₃	C ₆ H ₁₃	SCH ₃	SCH ₃
D-17	C ₆ H ₁₃	C ₆ H ₁₃	N(CH ₃) ₂	N(CH ₃) ₂
D-18	Bu	Bu	N(CH ₃) ₂	N(CH ₃) ₂
D-19	Et	Et	N(CH ₃) ₂	N(CH ₃) ₂
D-20	H	H	N(CH ₃) ₂	N(CH ₃) ₂
D-21	Ph	Ph	N(CH ₃) ₂	N(CH ₃) ₂
D-22	C ₆ H ₁₃	C ₆ H ₁₃	N(CH ₃) ₂	N(CH ₃) ₂
D-23	Bu	Bu	N(CH ₃) ₂	N(CH ₃) ₂

Compounds E-1 to E-35 can be obtained in a manner analogous to Example 6.



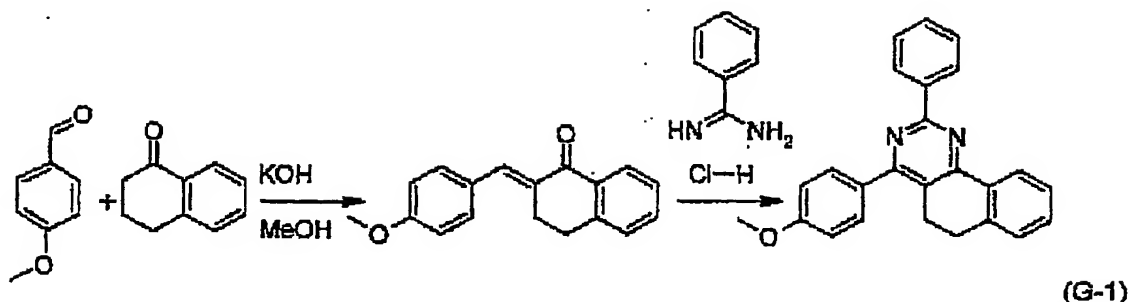
Cpd.	Y ³	X ³
E-1	H	H
E-2	H	H
E-3	H	H
E-4	H	H
E-5	H	H
E-6	OCH ₃	OCH ₃
E-7	OCH ₃	OCH ₃
E-8	OCH ₃	OCH ₃
E-9	OCH ₃	OCH ₃
E-10	OCH ₃	OCH ₃
E-11	OCH ₃	H
E-12	OCH ₃	H
E-13	OCH ₃	H
E-14	OCH ₃	H
E-15	OCH ₃	H
E-16	SCH ₃	SCH ₃
E-17	SCH ₃	SCH ₃
E-18	SCH ₃	SCH ₃
E-19	SCH ₃	SCH ₃
E-20	SCH ₃	SCH ₃
E-21	SCH ₃	H
E-22	SCH ₃	H
E-23	SCH ₃	H
E-24	SCH ₃	H
E-25	SCH ₃	H
E-26	N(CH ₃) ₂	N(CH ₃) ₂
E-27	N(CH ₃) ₂	N(CH ₃) ₂
E-28	N(CH ₃) ₂	N(CH ₃) ₂
E-29	N(CH ₃) ₂	N(CH ₃) ₂
E-30	N(CH ₃) ₂	N(CH ₃) ₂
E-31	N(CH ₃) ₂	H
E-32	N(CH ₃) ₂	H
E-33	N(CH ₃) ₂	H
E-34	N(CH ₃) ₂	H
E-35	N(CH ₃) ₂	H

Compounds F-1 to F-35 can be obtained in a manner analogous to Example 6.



Cpd.	R ¹⁰¹	R ¹⁰²	Y ³	X ³
F-1	C ₆ H ₁₃	C ₆ H ₁₃	H	H
F-2	Bu	Bu	H	H
F-3	Et	Et	H	H
F-4	H	H	H	H
F-5	Ph	Ph	H	H
F-6	C ₆ H ₁₃	C ₆ H ₁₃	OCH ₃	OCH ₃
F-7	Bu	Bu	OCH ₃	OCH ₃
F-8	Et	Et	OCH ₃	OCH ₃
F-9	H	H	OCH ₃	OCH ₃
F-10	Ph	Ph	OCH ₃	OCH ₃
F-11	C ₆ H ₁₃	C ₆ H ₁₃	OCH ₃	H
F-12	Bu	Bu	OCH ₃	H
F-13	Et	Et	OCH ₃	H
F-14	H	H	OCH ₃	H
F-15	Ph	Ph	OCH ₃	H
F-16	C ₆ H ₁₃	C ₆ H ₁₃	SCH ₃	SCH ₃
F-17	Bu	Bu	SCH ₃	SCH ₃
F-18	Et	Et	SCH ₃	SCH ₃
F-19	H	H	SCH ₃	SCH ₃
F-20	Ph	Ph	SCH ₃	SCH ₃
F-21	C ₆ H ₁₃	C ₆ H ₁₃	SCH ₃	H
F-22	Bu	Bu	SCH ₃	H
F-23	Et	Et	SCH ₃	H
F-24	H	H	SCH ₃	H
F-25	Ph	Ph	SCH ₃	H
F-26	C ₆ H ₁₃	C ₆ H ₁₃	N(CH ₃) ₂	N(CH ₃) ₂
F-27	Bu	Bu	N(CH ₃) ₂	N(CH ₃) ₂
F-28	Et	Et	N(CH ₃) ₂	N(CH ₃) ₂
F-29	H	H	N(CH ₃) ₂	N(CH ₃) ₂
F-30	Ph	Ph	N(CH ₃) ₂	N(CH ₃) ₂
F-31	C ₆ H ₁₃	C ₆ H ₁₃	N(CH ₃) ₂	H
F-32	Bu	Bu	N(CH ₃) ₂	H
F-33	Et	Et	N(CH ₃) ₂	H
F-34	H	H	N(CH ₃) ₂	H
F-35	Ph	Ph	N(CH ₃) ₂	H

Example 7 (G-1)



To 14.6 g (0.100 mol) of tetralone and 15.0 g (1.10 mol) p-methoxy-benzaldehyd in 100 ml absolute methanol 660 mg potassium hydroxide are added. The reaction mixture is refluxed for 18 h under argon and then cooled to 25 °C. The formed product is filtered off and washed with methanol. To 6.61 g (25.0 mmol) of said product in 50 ml water free ethanol 1.96 g (12.5 mmol) benzamidine hydrochloride are added. A solution of 1.65 g (25.0 mmol) potassium hydroxide in 50 ml water free ethanol is added during 15 min. Dry air is bubbled through the reaction mixture. The reaction mixture is refluxed for 24 h and then poured into water. The water phase is extracted with dichloromethane. The organic phase is dried with magnesium sulfate, the solvent is removed by distillation and the remaining residue is purified by column chromatography (toluene / hexane 1/1). The product G-1 having a melting point of 169 °C is obtained.

Application Example 1

Present compounds A1, A2, A3, B1, B2, C1 and G1 as light emitting materials, respectively, 2,5-bis(1-naphthyl)-1,3,4-oxadiazole and a polycarbonate resin in a weight ratio of 5:3:2 are dissolved in tetrahydrofuran, and the solution is spin-coated on a cleaned glass substrate with an ITO electrode to form a light-emitting layer having a thickness of 100 nm. An electrode having a thickness of 150 nm is formed thereon from a magnesium/indium alloy having a magnesium/indium mixing ratio of 10/1, to obtain an organic EL device. The device exhibits light emission with excellent brightness and efficiency at a direct current voltage of 5 V.

Application Example 2

Compounds A1, A2, A3, B1, B2, C1 and G1, respectively, are vacuum-deposited on a cleaned glass substrate with an ITO electrode to form a light-emitting layer having a thickness of 100 nm. An electrode having a thickness of 100 nm is formed thereon from a magnesium/silver alloy having a magnesium/silver mixing ratio of 10/1, to obtain an organic EL device. The light-emitting layer is formed by deposition under a vacuum of 10^6 Torr at a substrate temperature of room temperature. The device shows emission having an excellent brightness and efficiency at a direct current voltage of 5 V.

Application Example 3

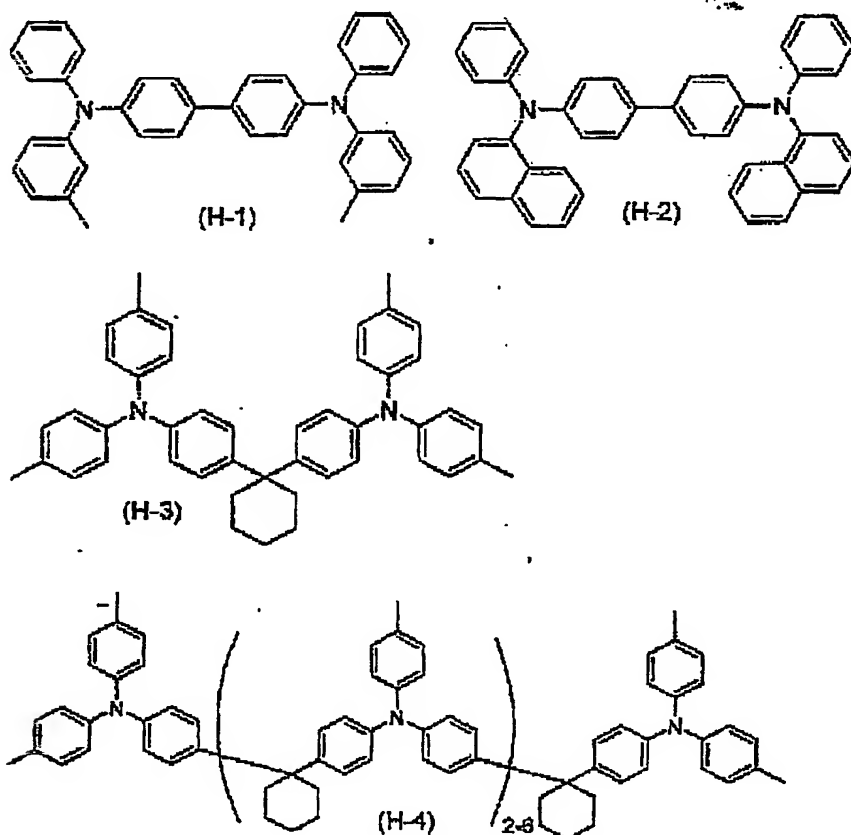
Compounds A1, A2, A3, B1, B2, C1 and G1, respectively, are dissolved in methylene chloride tetrahydrofuran, and the solution is spin-coated on a cleaned glass substrate with an ITO electrode to form a light-emitting layer having a thickness of 50 nm. Then, aluminum bis(2-methyl-8-quinolate)(2-naphtholate) is vacuum-deposited to form an electron-injecting layer having a thickness of 10 nm, and an electrode having a thickness of 100 nm is formed thereon from a magnesium/aluminum alloy having a magnesium/aluminum mixing ratio of 10/1, to obtain an organic EL device. The light-emitting layer and the electron-injecting layer are formed by deposition under a vacuum of 10^6 Torr at a substrate temperature of room temperature. The device shows an emission having an excellent brightness and efficiency at a direct current voltage of 5 V.

Application Example 4

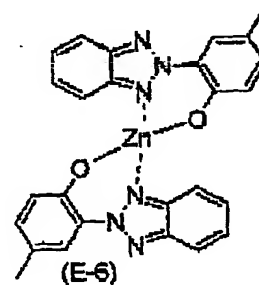
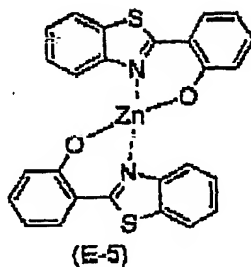
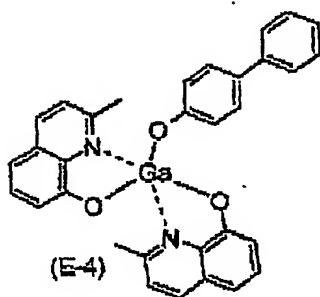
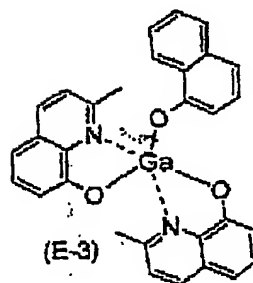
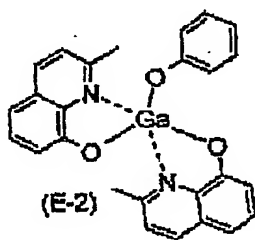
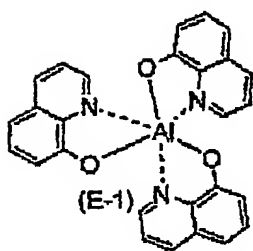
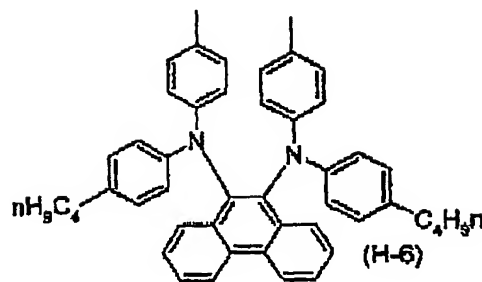
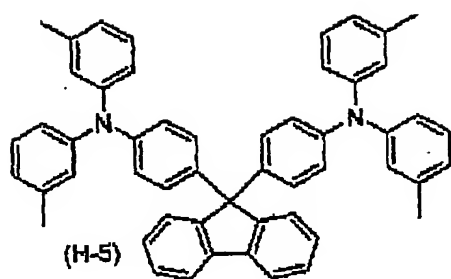
Compounds A1, A2, A3, B1, B2, C1 and G1, respectively, are vacuum-deposited on a cleaned glass substrate with an ITO electrode to form a light-emitting layer having a thickness of 50 nm. Then, aluminum tris(8-hydroxyquinolate) is vacuum-deposited to form an electron-injecting layer having a thickness of 10 nm and an electrode having a thickness of 100 nm is formed thereon from an aluminum/lithium alloy having an aluminum/lithium mixing ratio of 50/1, to obtain an organic EL device. A hole-injecting layer and the light-emitting layer are formed by deposition under a vacuum of 10^6 Torr at a substrate temperature of room temperature. The device shows a light emission having an excellent brightness and efficiency at a direct current voltage of 5 V.

Application Example 5

One of hole-injecting materials (H-1) to (H-6) is vacuum-deposited on a cleaned glass substrate with an ITO electrode, to form a hole-injecting layer having a thickness of 30 nm. Then, one of light-emitting materials A1, A2, A3, B1, B2, C1 and G1, respectively is vacuum-deposited to form a light-emitting layer having a thickness of 30 nm. Further, one of electron-injecting materials (E-1) to (E-6) is vacuum-deposited to form an electron-injecting layer having a thickness of 30 nm. An electrode having a thickness of 150 nm is formed thereon from a magnesium/silver alloy having a magnesium/silver mixing ratio of 10/1, to obtain an organic EL device. Each layer is formed under a vacuum of 10^{-6} Torr at a substrate temperature of room temperature. All the organic EL devices obtained in these Examples shows high brightness and efficiency.



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Application Example 6

On a cleaned glass substrate with an ITO electrode, 4,4',4''-tris(N-(3-methylphenyl)-N-phenylamino)triphenylamine is vacuum-deposited to form a first hole-injecting layer having a thickness of 25 nm. Further, a hole-injecting material (H-1) is vacuum-deposited to form a second hole-injecting layer having a thickness of 5 nm. Then, compounds A1, A2, A3, B1, B2, C1 and G1, respectively, as light-emitting materials are vacuum-deposited to form a light-emitting layer having a thickness of 20 nm. Further, an electron-injecting material (E-1) is vacuum-deposited to form an electron-injecting layer having a thickness of 30 nm. Then, an electrode having a thickness of 150 nm is formed thereon from a magnesium/silver alloy having an magnesium/silver mixing ratio of 10/1, to obtain an organic EL device. The device shows emission having an outstanding brightness and efficiency at a direct current voltage of 5 V.

Application Example 7

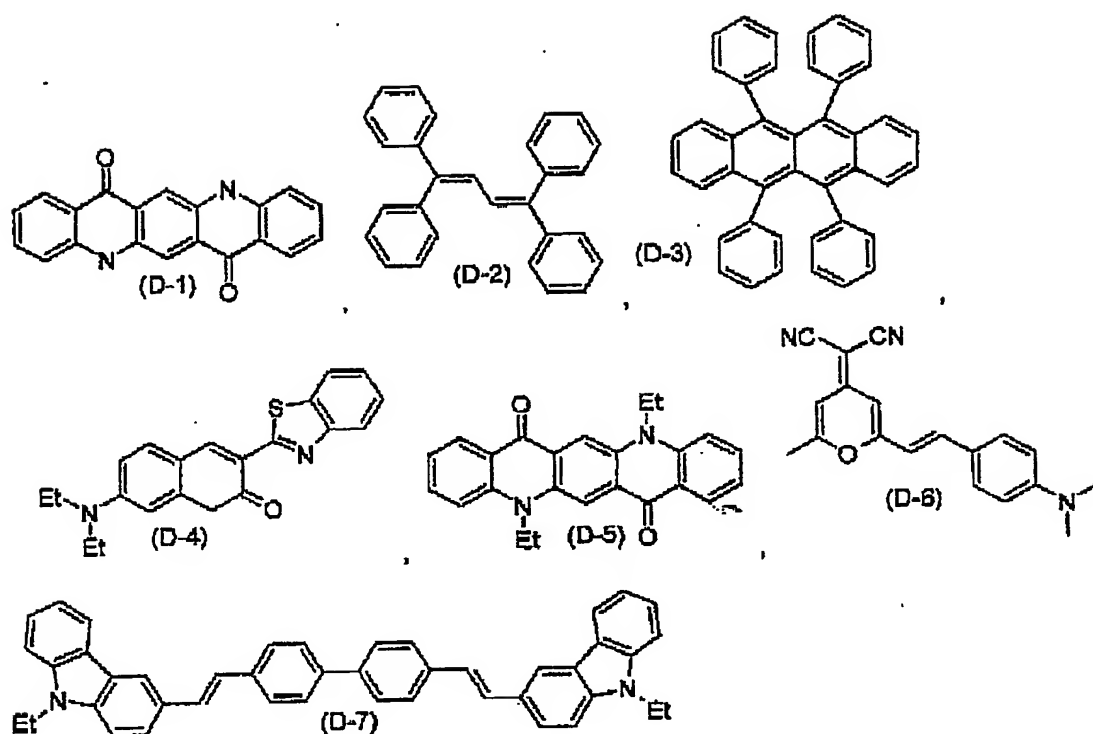
On a cleaned glass substrate with an ITO electrode, 4,4',4"-tris(N-(1-naphthyl)-N-phenylamino)triphenylamine is vacuum-deposited to form a first hole-injecting layer having a thickness of 25 nm. Further, a hole-injecting material (H-2) is vacuum-deposited to form a second hole-injecting layer having a thickness of 5 nm. Then, compounds A1, A2, A3, B1, B2, C1 and G1, respectively, as light-emitting materials are vacuum-deposited to form a light-emitting layer having a thickness of 20 nm. Further, an electron-injecting material (E-5) is vacuum-deposited to form an electron-injecting layer having a thickness of 30 nm. Then, an electrode having a thickness of 150 nm is formed thereon from a magnesium/silver alloy having an magnesium/silver mixing ratio of 10/1, to obtain an organic EL device. The device shows an emission having a outstanding brightness and efficiency at a direct current voltage of 5 V.

Application Example 8

A hole-injecting material (H-5) is vacuum-deposited on a cleaned glass substrate with an ITO electrode to form a hole-injecting layer having a thickness of 20 nm. Then, compounds A1, A2, A3, B1, B2, C1 and G1, respectively, as light-emitting materials are vacuum-deposited to form a light-emitting layer having a thickness of 20 nm. Further, an electron-injecting material (E-2) is vacuum-deposited to form a first electron-injecting layer having a thickness of 20 nm. Then, an electron-injecting material (E-5) is vacuum-deposited to form a second electron-injecting layer having a thickness of 10 nm, and an electrode having a thickness of 150 nm is formed thereon from a magnesium/silver alloy having an magnesium/silver mixing ratio of 10/1, to obtain an organic EL device. The device shows light emission having an excellent brightness and efficiency at a direct current voltage of 5 V.

Application Example 9

An organic EL device is prepared in the same manner as in Example 5 except that the light-emitting layer is replaced with a 30 nm thick light-emitting layer formed by vacuum-depositing compounds A1, A2, A3, B1, B2, C1 and G1, respectively, and one of the dopant compounds (D-1) to (D-7) in a weight ratio of 100:1. All the organic EL devices obtained in these Examples shows high brightness characteristics and gives intended light emission colors.



Application Example 10

An organic EL device is prepared in the same manner as in Example 5 except that the light-emitting layer is replaced with a 30 nm thick light-emitting layer formed by vacuum-depositing compounds A1, A2, A3, B1, B2, C1 and G1, respectively and one of Compounds (D-1) to (D-7) in a weight ratio of 100:1. All the organic EL devices obtained in these Examples shows high brightness characteristics, or a maximum brightness and gives intended light emission colors.

Application Example 11

A hole-injecting material (H-2) is vacuum-deposited on a cleaned glass substrate with an ITO electrode to form a hole-injecting layer having a thickness of 30 nm. Then, 4,4'-bis(α,α -diphenylvinyl)biphenyl and a light-emitting material selected from compounds A1, A2, A3, B1, B2, C1 and G1 for a light-emitting layer are vacuum-deposited in a weight ratio of 100:5 to form a light-emitting layer having a thickness of 30 nm. Further, an electron-injecting material (E-3) is vacuum-deposited to form an electron-injecting layer having a thickness of 30 nm. Then, an electrode having a thickness of 150 nm is formed thereon from a magnesium/silver alloy having an magnesium/silver mixing ratio of 10/1, to obtain an organic EL device. The device shows an emission having an outstanding brightness and efficiency at a direct current voltage of 5 V.

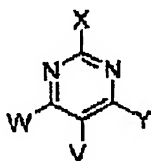
Application Example 12

An organic EL device is prepared in the same manner as in Example 11 except that the light-emitting layer is replaced with a 30 nm thick light-emitting layer formed by vacuum-depositing aluminum tris(8-hydroxyquinolate) and one of the light-emitting materials A1, A2, A3, B1, B2, C1 and G1 in a weight ratio of 100:3. All the organic EL devices obtained in these Examples shows high brightness characteristics at a direct current of 5 V.

The organic EL devices obtained in the Application Examples of the present invention show an excellent light emission brightness and achieved a high light emission efficiency. When the organic EL devices obtained in the above Examples are allowed to continuously emit light at 3 (mA/cm²), all the organic EL devices remain stable. Since the light-emitting materials of the present invention have a very high fluorescence quantum efficiency, the organic EL devices using the light-emitting materials achieved light emission with a high brightness in a low electric current applied region, and when the light-emitting layer additionally uses a doping material, the organic EL devices are improved in maximum light emission brightness and maximum light emission efficiency. Further, by adding a doping material having a different fluorescent color to the light-emitting material of the present invention, there are obtained light-emitting devices having a different light emission color. The organic EL devices of the present invention accomplish improvements in light emission efficiency and light emission brightness and a longer device life, and does not impose any limitations on a light-emitting material, a dopant, a hole-injecting material, an electron-injecting material, a sensitizer, a resin and an electrode material used in combination and the method of producing the device. The organic EL device using the material of the present invention as a light-emitting material achieves light emission having a high brightness with a high light emission efficiency and a longer life as compared with conventional devices. According to the light-emitting material of the present invention and the organic EL device of the present invention, there can be achieved an organic EL device having a high brightness, a high light emission efficiency and a long life.

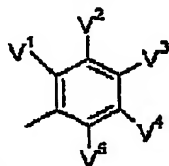
What is Claimed is:

1. An electroluminescent device comprising an anode, a cathode and one or a plurality of organic compound layers sandwiched therebetween, in which said organic compound layers comprise an organic compound containing one or more pyrimidine moieties.
2. An electroluminescent device according to claim 1, wherein the organic compound or compounds emit light below about 520 nm.
3. An electroluminescent device according to claim 1, wherein the organic compound or compounds emit light between about 380 nm and about 520 nm.
4. An electroluminescent device according to claim 1, wherein the organic compound or compounds have a NTSC coordinate of between about (0.12, 0.05) and about (0.16, 0.10).
5. An electroluminescent device according to claim 1, wherein the organic compound or compounds have a NTSC coordinate of about (0.14, 0.08).
6. An electroluminescent device according to claim 1, wherein the organic compound or compounds have a melting point above about 150°C.
7. An electroluminescent device according to claim 1, wherein the organic compound or compounds have a melting point above about 200°C.
8. An electroluminescent device according to claim 1, wherein the organic compound or compounds have a melting point above about 250°C.
9. An electroluminescent device according to claim 1, wherein the organic compound is a pyrimidine compound of formula



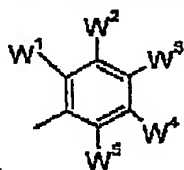
(I), wherein

V is C_6 - C_{24} aryl or C_2 - C_{24} heteroaryl, which can be substituted or unsubstituted, in



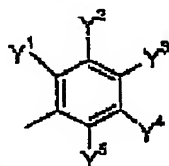
particular , H, C_1 - C_{18} alkyl; C_1 - C_{18} alkyl which is substituted by E and/or interrupted by D; C_2 - C_{18} alkenyl, C_2 - C_{18} alkenyl which is substituted by E and/or interrupted by D; C_2 - C_{18} alkynyl; C_2 - C_{18} alkynyl which is substituted by E and/or interrupted by D; C_1 - C_{18} alkoxy; C_1 - C_{18} alkoxy which is substituted by E and/or interrupted by D; $-SR^5$; $-NR^5R^6$;

W is C_6 - C_{24} aryl or C_2 - C_{24} heteroaryl, which can be substituted or unsubstituted, in



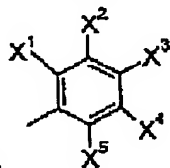
particular , H, C_1 - C_{18} alkyl; C_1 - C_{18} alkyl which is substituted by E and/or interrupted by D; C_2 - C_{18} alkenyl, C_2 - C_{18} alkenyl which is substituted by E and/or interrupted by D; C_2 - C_{18} alkynyl; C_2 - C_{18} alkynyl which is substituted by E and/or interrupted by D; C_1 - C_{18} alkoxy; C_1 - C_{18} alkoxy which is substituted by E and/or interrupted by D; $-SR^5$; $-NR^5R^6$;

Y is C_6 - C_{24} aryl or C_2 - C_{24} heteroaryl, which can be substituted or unsubstituted, in



particular , H, C_1 - C_{18} alkyl; C_1 - C_{18} alkyl which is substituted by E and/or interrupted by D; C_2 - C_{18} alkenyl, C_2 - C_{18} alkenyl which is substituted by E and/or interrupted by D; C_2 - C_{18} alkynyl; C_2 - C_{18} alkynyl which is substituted by E and/or interrupted by D; C_1 - C_{18} alkoxy; C_1 - C_{18} alkoxy which is substituted by E and/or interrupted by D; $-SR^5$; $-NR^5R^6$;

X is C_6 - C_{24} aryl or C_2 - C_{24} heteroaryl, which can be substituted or unsubstituted, in

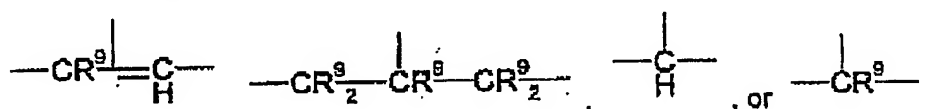


particular , H, C_1 - C_{18} alkyl; C_1 - C_{18} alkyl which is substituted by E and/or interrupted by D; C_2 - C_{18} alkenyl, C_2 - C_{18} alkenyl which is substituted by E and/or interrupted by D; C_2 - C_{18} alkynyl; C_2 - C_{18} alkynyl which is substituted by E and/or interrupted by D; C_1 - C_{18} alkoxy; C_1 - C_{18} alkoxy which is substituted by E and/or

interrupted by D; $-SR^5$; $-NR^5R^6$; wherein the groups V^1 to V^5 , W^1 to W^5 , X^1 to X^5 and Y^1 to Y^5 are independently of each other H; halogen, C_6-C_{18} aryl; C_6-C_{18} aryl which is substituted by G; C_1-C_{18} alkyl; C_1-C_{18} alkyl which is substituted by E and/or interrupted by D; C_7-C_{18} alkylaryl; C_7-C_{18} alkylaryl which is substituted by E and/or interrupted by D; C_2-C_{18} alkenyl; C_2-C_{18} alkenyl which is substituted by E and/or interrupted by D; C_2-C_{18} alkynyl; C_2-C_{18} alkynyl which is substituted by E and/or interrupted by D; C_1-C_{18} alkoxy, C_1-C_{18} alkoxy which is substituted by E and/or interrupted by D; $-SR^5$; $-NR^5R^6$; C_2-C_{18} heteroaryl; C_2-C_{18} heteroaryl which is substituted by L; $-SOR^4$; $-SO_2R^4$; $-COR^3$; $-COOR^7$; $-CONR^5R^6$; C_4-C_{18} cycloalkyl; C_4-C_{18} cycloalkyl which is substituted by E and/or interrupted by D; C_4-C_{18} cycloalkenyl; C_4-C_{18} cycloalkenyl which is substituted by E and/or interrupted by D; or

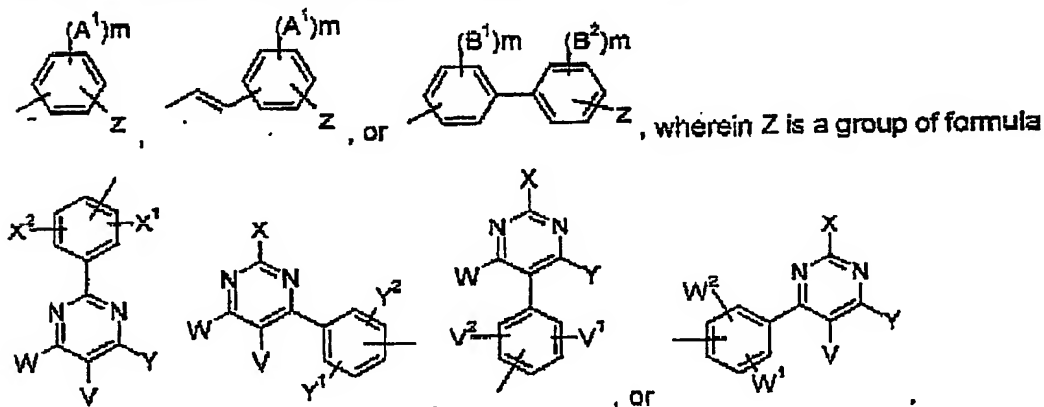
W^5 or Y^5 together with V form a group $-CR^9_2$, $-CR^9_2CR^9_2$, $-C(=O)CR^9_2$, $-C(=O)-$, or $-CR^9=CR^9-$, or

W^5 and Y^5 together with V form a group



wherein R^9 is H; C_1-C_{18} alkyl, C_1-C_{18} alkyl which is interrupted by $-Q-$, C_6-C_{18} aryl, C_6-C_{18} aryl which is substituted by C_1-C_{18} alkyl, or C_1-C_{18} alkoxy, or one of the substituents

V^1 to V^5 , W^1 to W^5 , X^1 to X^5 , or Y^1 to Y^5 is a group of the formula $-Z$, $-Ar-Z$, wherein Ar is C_6-C_{24} aryl or C_5-C_{24} heteroaryl, which can be substituted, in particular



wherein

A^1 , B^1 and B^2 are independently of each other H; C_6-C_{18} aryl; C_6-C_{18} aryl which is substituted by G; C_1-C_{18} alkyl; C_1-C_{18} alkyl which is substituted by E and/or interrupted by D; C_7-C_{18} alkylaryl; C_7-C_{18} alkylaryl which is substituted by E and/or interrupted by D; C_2-C_{18} alkenyl; C_2-C_{18} alkenyl which is substituted by E and/or interrupted by D;

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C_2-C_{18} alkynyl; C_2-C_{18} alkynyl which is substituted by E and/or interrupted by D;

C_1-C_{18} alkoxy, C_1-C_{18} alkoxy which is substituted by E and/or interrupted by D; $-SR^5$; -

NR^5R^6 ; C_2-C_{18} heteroaryl; C_2-C_{18} heteroaryl which is substituted by L; $-SOR^4$; $-SO_2R^4$;

$-COR^8$; $-COOR^7$; $-CONR^5R^6$; C_4-C_{18} cycloalkyl; C_4-C_{18} cycloalkyl which is substituted by

E and/or interrupted by D; C_4-C_{18} cycloalkenyl; C_4-C_{18} cycloalkenyl which is substituted

by E and/or interrupted by D; or

two substituents A^1 , B^1 , B^2 or B^1 and B^2 form a five to seven membered ring, which can be substituted,

m is an integer of 1 to 4; and W^1 , W^2 , Y^1 , Y^2 , X^1 , X^2 , V, W, X and Y are as defined above;

D is $-CO-$; $-COO-$; $-OCOO-$; $-S-$; $-SO-$; $-SO_2-$; $-O-$; $-NR^5-$; $-SiR^5R^6-$; $-POR^5-$; $-CR^5=CR^6-$; or $-C\equiv C-$;

E is $-OR^5$; $-SR^5$; $-NR^5R^6$; $-COR^8$; $-COOR^7$; $-CONR^5R^6$; $-CN$; $-OCOOR^7$; or halogen;

G is E; K; heteroaryl; heteroaryl which is substituted by C_5-C_{18} aryl; C_6-C_{18} aryl which is substituted by E and/or K;

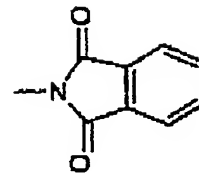
K is C_1-C_{18} alkyl; C_1-C_{18} alkyl which is substituted by E and/or interrupted by D; C_7-C_{18} alkylaryl which is substituted by E and/or interrupted by D; C_2-C_{18} alkenyl; C_2-C_{18} alkenyl which is substituted by E and/or interrupted by D; C_2-C_{18} alkynyl; C_2-C_{18} alkynyl which is substituted by E and/or interrupted by D; C_1-C_{18} alkoxy, C_1-C_{18} alkoxy which is substituted by E and/or interrupted by D; C_4-C_{18} cycloalkyl; C_4-C_{18} cycloalkyl which is substituted by E and/or interrupted by D; C_4-C_{18} cycloalkenyl; or C_4-C_{18} cycloalkenyl which is substituted by E and/or interrupted by D;

L is E; K; C_6-C_{18} aryl; or C_6-C_{18} aryl which is substituted by G, E and/or K;

R^4 is C_6-C_{18} aryl; C_6-C_{18} aryl which is substituted by C_1-C_{18} alkyl, C_1-C_{18} alkoxy; C_1-C_{18} alkyl; or C_1-C_{18} alkyl which is interrupted by $-O-$;

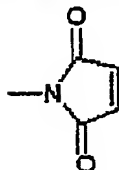
R^5 and R^6 are independently of each other H; C_6-C_{18} aryl; C_6-C_{18} aryl which is substituted by C_1-C_{18} alkyl, C_1-C_{18} alkoxy; C_1-C_{18} alkyl; or C_1-C_{18} alkyl which is interrupted by $-O-$;

or



or

R^5 and R^6 together form a five or six membered ring, in particular



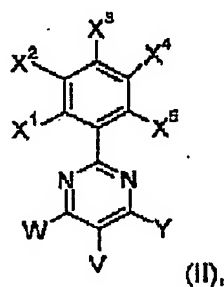
R^7 is H; C_6-C_{16} aryl; C_6-C_{16} aryl which is substituted by C_1-C_{16} alkyl, C_1-C_{16} alkoxy; C_1-C_{16} alkyl; C_1-C_{16} alkyl which is interrupted by $-O-$;

R^8 is H; C_6-C_{16} aryl; C_6-C_{16} aryl which is substituted by C_1-C_{16} alkyl, C_1-C_{16} alkoxy; C_1-C_{16} alkyl; C_1-C_{16} alkyl which is interrupted by $-O-$.

or two substituents selected from V^1 to V^5 , W^1 to W^5 , X^1 to X^5 , Y^1 to Y^5 which are in neighborhood to each other form a five to seven membered ring,

with the proviso that at least one of the groups V, W, X and Y is a C_6-C_{24} aryl, or C_{2-24} heteroaryl group, which can be substituted.

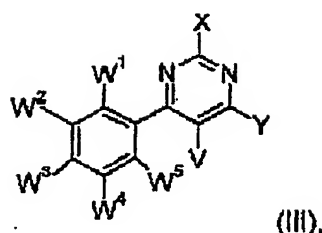
10. An electroluminescent device according to claim 9, comprising a pyrimidine compound of formula



wherein V, W, Y and X^1 to X^5 are as defined in claim 9.

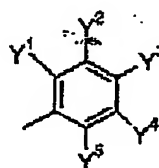
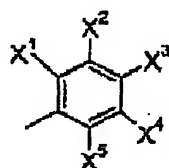
11. An electroluminescent device according to claim 9, comprising a pyrimidine compound of formula

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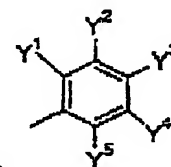
wherein V, X, Y and W¹ to W⁵ are as defined in claim 9.

12. An electroluminescent device according to claim 11, comprising a pyrimidine compound of formula III, wherein

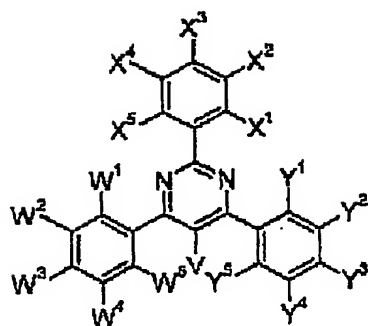


Y is R¹, if X is , or X is R¹, if Y is , R¹ is H, C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl; C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy; C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; or -NR⁵R⁶; wherein X¹ to X⁵, Y¹ to Y⁵, E, D, R⁵ and R⁶ are as defined in claim 9.

13. An electroluminescent device according to claim 11, wherein V in formula III is H.

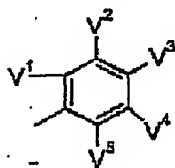


14. An electroluminescent device according to claim 11, wherein Y is wherein W¹ and W⁵ and Y¹ and Y⁵ are independently of each other H; C₁-C₁₈alkyl; or C₁-C₁₈alkyl which is substituted by E and/or interrupted by D.
15. An electroluminescent device according to claim 9, comprising a pyrimidine compound of formula



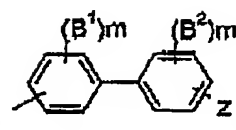
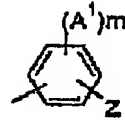
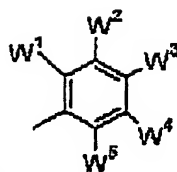
(IV), wherein

- V, W¹ to W⁶, X¹ to X⁵ and Y¹ to Y⁵ are as defined in claim 9.
16. An electroluminescent device according to claim 15, wherein W³, X³ and Y³ are selected from the group consisting of C₆-C₁₈aryl; C₆-C₁₈aryl which is substituted by G; C₂-C₁₈heteroaryl; C₂-C₁₈heteroaryl which is substituted by L, C₁-C₁₈alkoxy, -SR⁵; -NR⁵R⁵, wherein G, L, R⁵ and R⁶ are as defined in claim 9.
 17. An electroluminescent device according to claim 15, wherein V in formula IV is H.
 18. An electroluminescent device according to claim 15, wherein W¹ and W⁵, Y¹ and Y⁵ as well as X¹ and X⁵ are independently of each other H; C₁-C₁₈alkyl; or C₁-C₁₈alkyl which is substituted by E and/or interrupted by D, wherein E and D are as defined in claim 9.
 19. An electroluminescent device according to claim 9, wherein V is a group of the formula

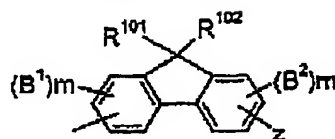


; H, C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl, C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy; C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; or -NR⁵R⁵; and

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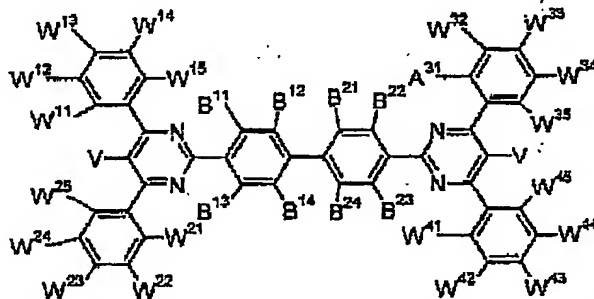
W is a group of the formula



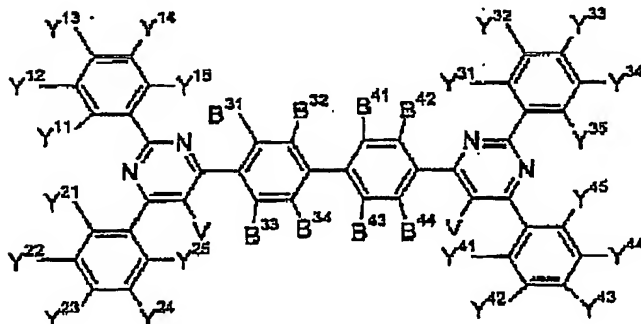
particular

H, C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl, C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy; C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; or -NR⁵R⁶; wherein W¹ to W⁵, D, V¹ to V⁵, E, A¹, B¹, B², R⁵, R⁶, m and Z are as defined in claim 9 and R¹⁰¹ and R¹⁰² are independently of each other H, C₁-C₈alkyl, C₆-C₂₄aryl, or C₅-C₇cycloalkyl, in particular H or C₁₋₄-alkyl.

20. An electroluminescent device according to claim 9, comprising a pyrimidine compound of formula



(VI) or



(VII), wherein

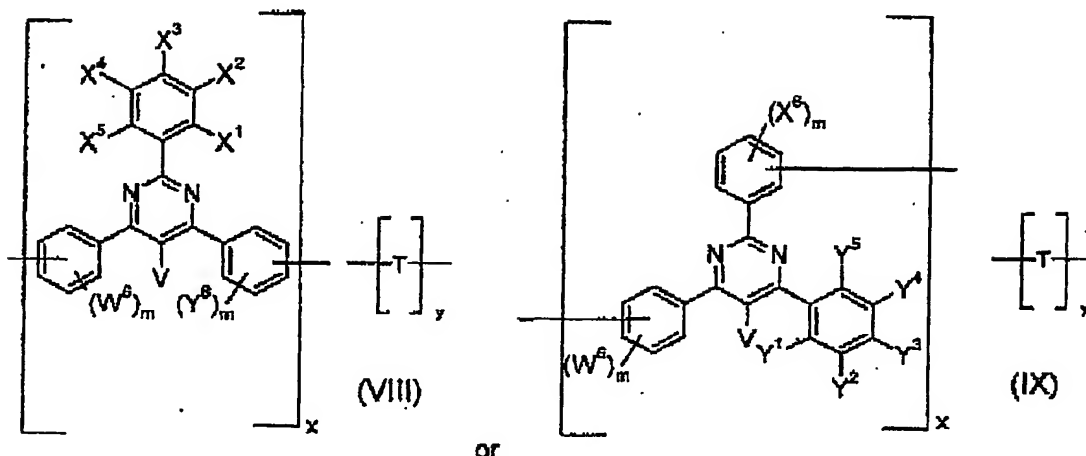
W¹¹ to W¹⁵, W²¹ to W²⁵, W³¹ to W³⁵, W⁴¹ to W⁴⁵, Y¹¹ to Y¹⁵, Y²¹ to Y²⁵, Y³¹ to Y³⁵ and Y⁴¹ to Y⁴⁵ are independently of each other H; C₆-C₁₈aryl; C₆-C₁₈aryl which is substituted by G; C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₇-C₁₈alkylaryl; C₇-C₁₈alkylaryl which is substituted by E and/or interrupted by D; C₂-

C₁₈alkenyl; C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy, C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; -NR⁶R⁶; C₂-C₁₈heteroaryl; C₂-C₁₈heteroaryl which is substituted by L; -SOR⁴; -SO₂R⁴; -COR⁸; -COOR⁷; -CONR⁵R⁸; C₄-C₁₈cycloalkyl; C₄-C₁₈cycloalkyl which is substituted by E and/or interrupted by D; C₄-C₁₈cycloalkenyl; C₄-C₁₈cycloalkenyl which is substituted by E and/or interrupted by D;

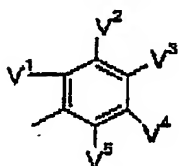
V is H; C₆-C₁₈aryl; C₆-C₁₈aryl which is substituted by G; C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₇-C₁₈alkylaryl; C₇-C₁₈alkylaryl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl; C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy, C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; or -NR⁶R⁶; C₂-C₁₈heteroaryl; C₂-C₁₈heteroaryl which is substituted by L; -SOR⁴; -SO₂R⁴; -COR⁸; -COOR⁷; -CONR⁵R⁸; C₄-C₁₈cycloalkyl; C₄-C₁₈cycloalkyl which is substituted by E and/or interrupted by D; C₄-C₁₈cycloalkenyl; C₄-C₁₈cycloalkenyl which is substituted by E and/or interrupted by D; B¹¹ to B¹⁴, B²¹ to B²⁴, B³¹ to B³⁴ and B⁴¹ to B⁴⁴ are independently of each other H; C₆-C₁₈aryl; C₆-C₁₈aryl which is substituted by G; C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₇-C₁₈alkylaryl; C₇-C₁₈alkylaryl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl; C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy, C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; -NR⁶R⁶; C₂-C₁₈heteroaryl; C₂-C₁₈heteroaryl which is substituted by L; -SOR⁴; -SO₂R⁴; -COR⁸; -COOR⁷; or -CONR⁵R⁸; C₄-C₁₈cycloalkyl; C₄-C₁₈cycloalkyl which is substituted by E and/or interrupted by D; C₄-C₁₈cycloalkenyl; C₄-C₁₈cycloalkenyl which is substituted by E and/or interrupted by D; wherein D, E, G, L, R⁴, R⁵, R⁶, R⁷ and R⁸ are as defined in claim 9.

21. An electroluminescent device according to claim 20, wherein V in formula VI or VII is H.
22. An electroluminescent device according to claim 9, wherein the organic compound is a polymer, comprising the following units:

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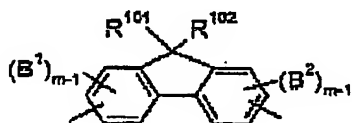
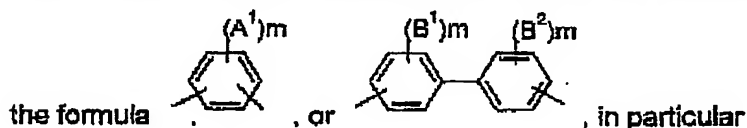


wherein x is chosen in the range of from 0.005 to 1, preferably from 0.01 to 1, and y from 0.995 to 0, preferably 0.99 to 0, and wherein $x + y = 1$, V is a group of the formula



, H, C_1 - C_{18} alkyl; C_1 - C_{18} alkyl which is substituted by E and/or interrupted by D; C_2 - C_{18} alkenyl, C_2 - C_{18} alkenyl which is substituted by E and/or interrupted by D; C_2 - C_{18} alkynyl; C_2 - C_{18} alkynyl which is substituted by E and/or interrupted by D; C_1 - C_{18} alkoxy; C_1 - C_{18} alkoxy which is substituted by E and/or interrupted by D; $-SR^5$; or $-NR^5R^6$; and

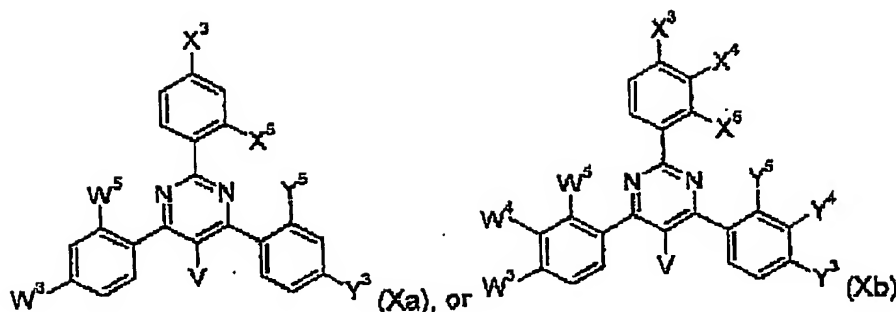
T is C_6 - C_{24} -aryl or C_5 - C_{24} -heteroaryl, which can be substituted, in particular a group of



wherein X^1 to X^5 , Y^1 to Y^5 , D, V^1 to V^5 , E, A^1 , B^1 , B^2 , R^5 , R^6 , m are as defined above, W^6 , X^6 and Y^6 independently of each other have the same meanings as X^1 , and R^{101} and R^{102} are independently of each other H, C_1 - C_8 alkyl, C_6 - C_{24} aryl, or C_5 - C_7 cycloalkyl.

23. An electroluminescent device according to claim 9, wherein the pyrimidine compound has the following formula

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wherein V is H, or C₁-C₈-alkyl,

X³ and X⁴ are independently of each other H, C₁-C₈-alkyl, C₁-C₈-alkoxy, C₁-C₈-thioalkyl, or phenyl,

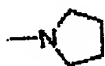
X⁵ is H, or C₁-C₈-alkoxy,

W⁵ is H, C₁-C₈-alkyl, or O(CH₂)_{m1}-X,

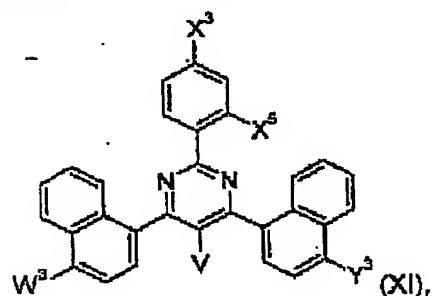
Y⁵ is H, C₁-C₈-alkyl, or O(CH₂)_{n1}-X,

Y³, Y⁴, W³ and W⁴ are independently of each other C₁-C₈-alkyl, C₁-C₈-alkoxy, C₁-C₈-thioalkyl, halogen, in particular Br, phenyl, or O(CH₂)_{n1}-X, wherein n1 is an integer of 1 to 5 and X is -O-(CH₂)_{m1}-CH₃, -OC(O)-(CH₂)_{m1}-CH₃, -C(O)-O-C₁-C₈-alkyl, -NR¹⁰³R¹⁰⁴, wherein m1 is an integer of 0 to 5 and R¹⁰³ and R¹⁰⁴ are independently of each other H, or C₁-C₈-alkyl, or R¹⁰³ and R¹⁰⁴ together form a five or six membered heterocyclic ring,

in particular



24. An electroluminescent device according to claim 9, wherein the organic compound has the following formula



wherein V is H, or C₁-C₈-alkyl,

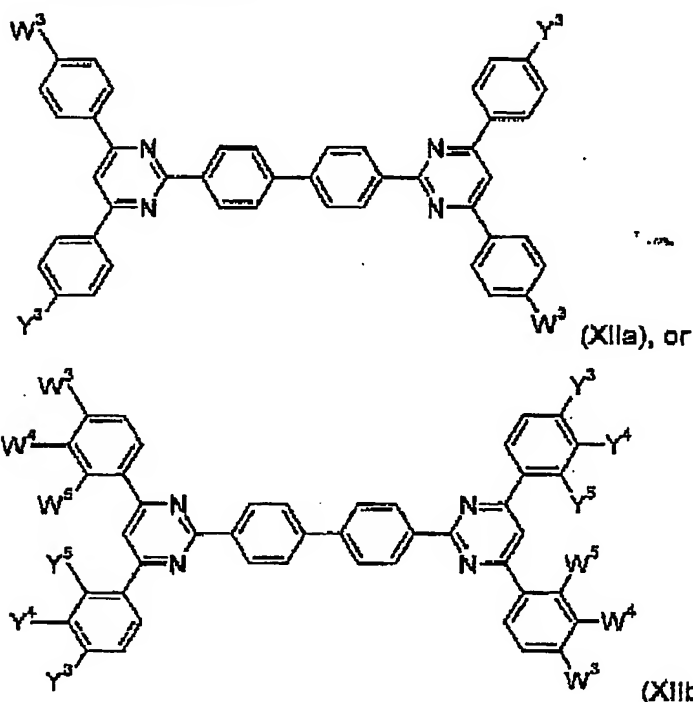
W³ is H, C₁-C₈-alkyl, or C₁-C₈-alkoxy,

X³ is H, C₁-C₈-alkoxy, phenyl or O(CH₂)_{n1}-X,

X⁵ is H, C₁-C₈-alkoxy, phenyl or O(CH₂)_{m1}-X,

Y^3 is H, C_1-C_8 alkyl, or C_1-C_8 alkoxy, wherein n_1 is an integer of 1 to 4 and X is $-O-(CH_2)_{m_1}CH_3$, $-OC(O)-(CH_2)_{m_1}CH_3$, $-C(O)-O-C_1-C_8$ alkyl, wherein m_1 is an integer of 0 to 5.

25. An electroluminescent device according to claim 9, wherein the organic compound has the following formula



wherein W^3 and W^4 are independently of each other H, $-NR^{103}R^{104}$, C_1-C_8 thioalkyl, or C_1-C_8 alkoxy,

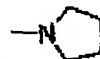
Y^3 and Y^4 are independently of each other H, $-NR^{103}R^{104}$, C_1-C_8 thioalkyl, or C_1-C_8 alkoxy, wherein R^{103} and R^{104} are independently of each other H, or C_1-C_8 alkyl.

W^5 is H, C_1-C_8 alkyl, or $O(CH_2)_{n_1}X$.

Y^5 is H, C_1-C_8 alkyl, or $O(CH_2)_{n_1}X$.

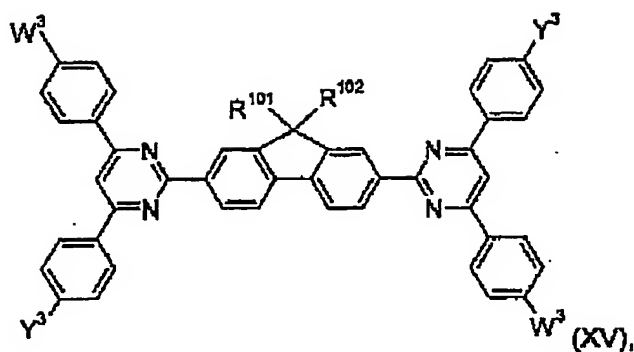
wherein n_1 is an integer of 1 to 5 and X is $-O-(CH_2)_{m_1}CH_3$, $-OC(O)-(CH_2)_{m_1}CH_3$, $-C(O)-O-C_1-C_8$ alkyl, $-NR^{103}R^{104}$, wherein m_1 is an integer of 0 to 5 and R^{103} and R^{104} are independently of each other H, or C_1-C_8 alkyl, or R^{103} and R^{104} together form a five

or six membered heterocyclic ring, in particular



26. An electroluminescent device according to claim 9, wherein the organic compound has the following formula

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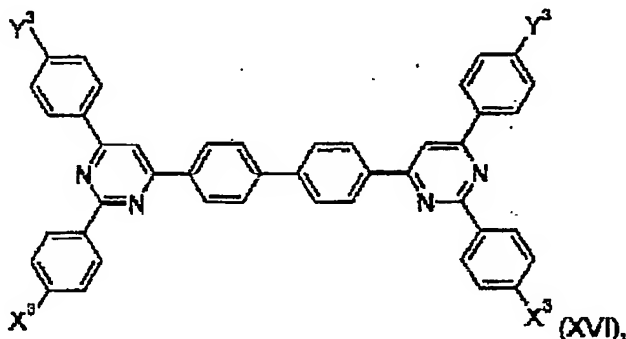


wherein W^3 is H, $-NR^{103}R^{104}$, C_1-C_8 thioalkyl, or C_1-C_8 alkoxy,

Y^3 is H, $-NR^{103}R^{104}$, C_1-C_8 thioalkyl, or C_1-C_8 alkoxy, wherein R^{103} and R^{104} are independently of each other H, or C_1-C_8 alkyl,

R^{101} and R^{102} are independently of each other H, C_1-C_8 alkyl, phenyl, or C_5-C_7 cycloalkyl, in particular cyclohexyl.

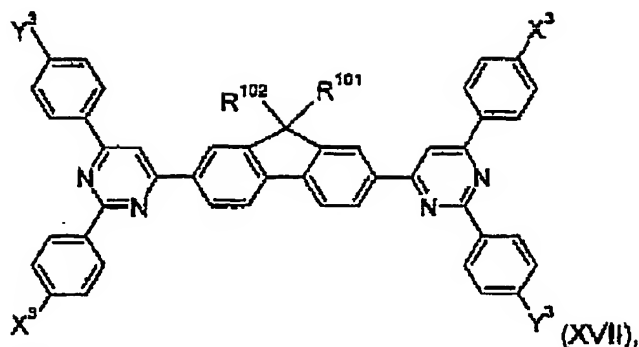
27. An electroluminescent device according to claim 9, wherein the organic compound has the following formula



wherein Y^3 is H, $-NR^{103}R^{104}$, C_1-C_8 thioalkyl, or C_1-C_8 alkoxy,

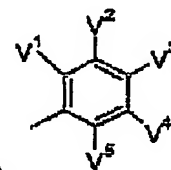
X^3 is H, $-NR^{103}R^{104}$, C_1-C_8 thioalkyl, or C_1-C_8 alkoxy, wherein R^{103} and R^{104} are independently of each other H, or C_1-C_8 alkyl.

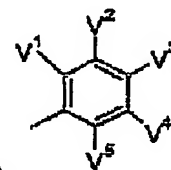
28. An electroluminescent device according to claim 9, wherein the organic compound has the following formula

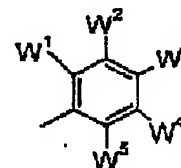


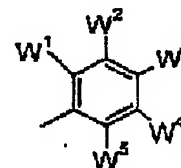
Y^3 is H, $-NR^{103}R^{104}$, C_1-C_8 thioalkyl, or C_1-C_8 alkoxy.

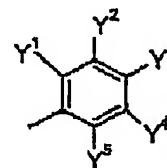
X^3 is H, $-NR^{103}R^{104}$, C_1-C_8 thioalkyl, or C_1-C_8 alkoxy, wherein R^{103} and R^{104} are independently of each other H, or C_1-C_8 alkyl, R^{101} and R^{102} are independently of each other H, C_1-C_8 alkyl, phenyl, or C_5-C_7 cycloalkyl, in particular cyclohexyl.

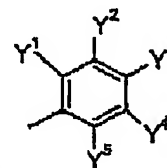


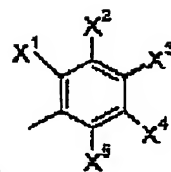
29. An electroluminescent device according to claim 9, wherein V is , wherein V^1 to V^5 are as defined in claim 9, with the proviso that at least one of the substituents V^1 to V^5 is different from H.

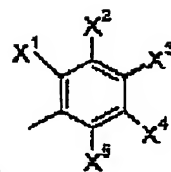


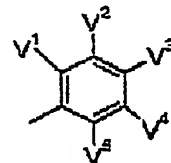
30. An electroluminescent device according to claim 9, wherein W is , wherein W^1 to W^5 are as defined in claim 9, with the proviso that at least one of the substituents W^1 to W^5 is different from H.

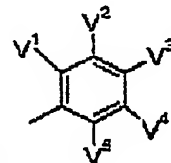


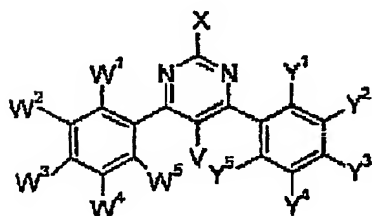
31. An electroluminescent device according to claim 9, wherein Y is , wherein Y^1 to Y^5 are as defined in claim 9, with the proviso that at least one of the substituents Y^1 to Y^5 is different from H.



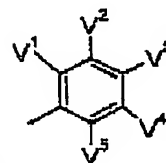
32. An electroluminescent device according to claim 9, wherein X is , wherein X¹ to X⁵ are as defined in claim 9, with the proviso that at least one of the substituents X¹ to X⁵ is different from H.

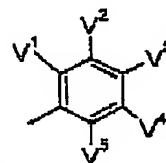


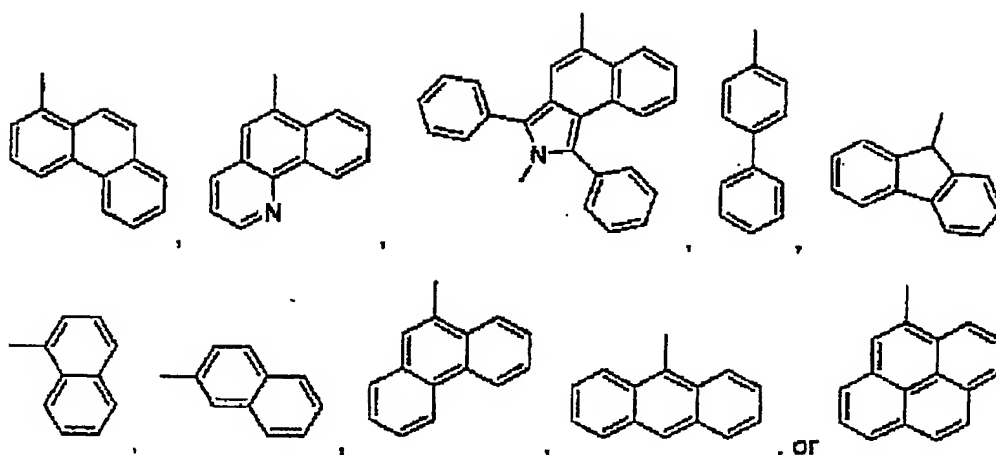
33. An electroluminescent device according to claim 15, wherein V is , wherein V¹ to V⁵ are as defined in claim 15, with the proviso that at least one substituent V¹ to V⁵ is different from hydrogen.
34. An electroluminescent device according to claim 9, comprising a pyrimidine compound of formula



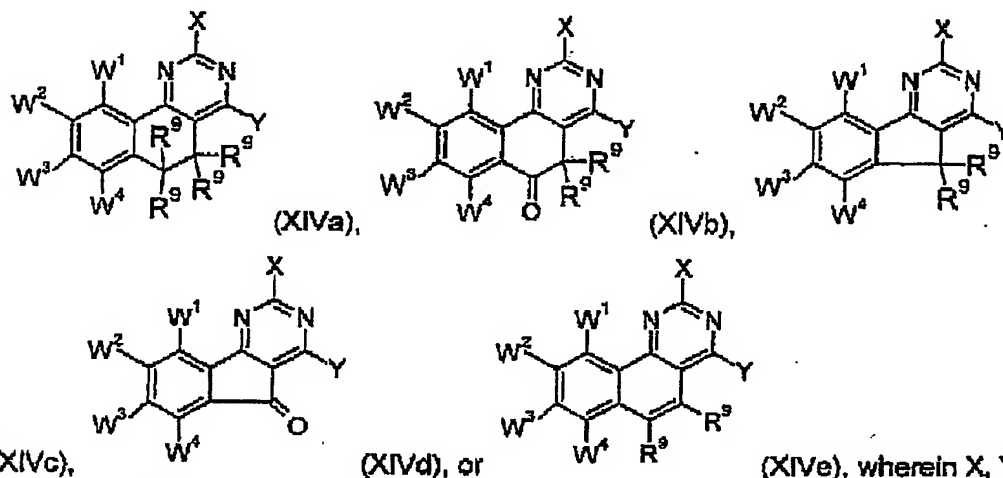
(XIII), wherein V, W¹ to W⁴, X, Y¹ to Y⁴ are as defined in claim 9.



35. An electroluminescent device according to claim 34, wherein V is , wherein V¹ to V⁵ are as defined in claim 34, with the proviso that at least one substituent V¹ to V⁵ is different from hydrogen.
36. An electroluminescent device according to claim 9, wherein W and Y are groups of the formula

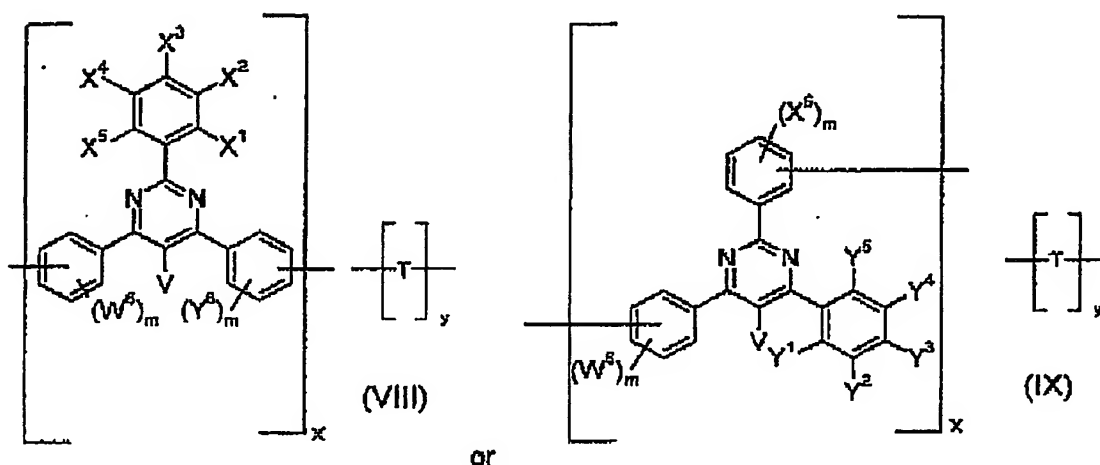


37. An electroluminescent device according to claim 9, comprising a pyrimidine compound of formula

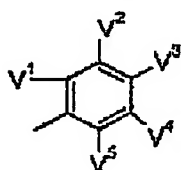


(XIVc), (XIVd), or (XIVe), wherein X, Y, W^1 to W^4 , and R^9 are as defined in claim 9.

38. A polymer, comprising the following units:

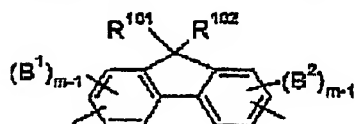
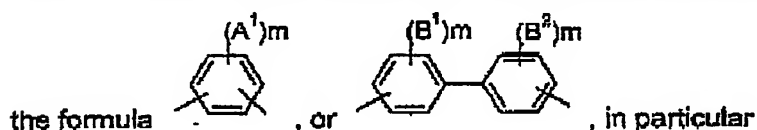


wherein x is chosen in the range of from 0.005 to 1; preferably from 0.01 to 1, and y from 0.995 to 0, preferably 0.99 to 0, and wherein $x + y = 1$, V is a group of the formula



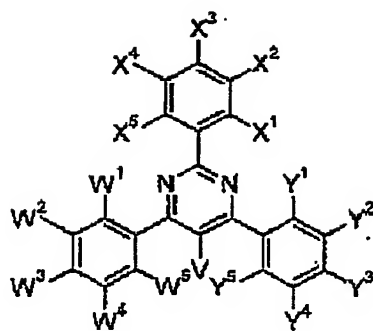
, H, C_1-C_{18} alkyl; C_1-C_{18} alkyl which is substituted by E and/or interrupted by D; C_2-C_{18} alkenyl; C_2-C_{18} alkenyl which is substituted by E and/or interrupted by D; C_2-C_{18} alkynyl; C_2-C_{18} alkynyl which is substituted by E and/or interrupted by D; C_1-C_{18} alkoxy; C_1-C_{18} alkoxy which is substituted by E and/or interrupted by D; $-SR^5$; or $-NR^5R^5$; and

T is C_6-C_{24} aryl or C_6-C_{24} -heteroaryl, which can be substituted, in particular a group of



wherein X^1 to X^5 , Y^1 to Y^5 , D, V^1 to V^5 , E, A^1 , B^1 , B^2 , R^5 , R^6 , m are as defined above, W^6 , X^6 and Y^6 independently of each other have the same meanings as X^1 , R^{101} and R^{102} are independently of each other H, C_1-C_8 alkyl, C_6-C_{24} aryl, or C_5-C_7 cycloalkyl.

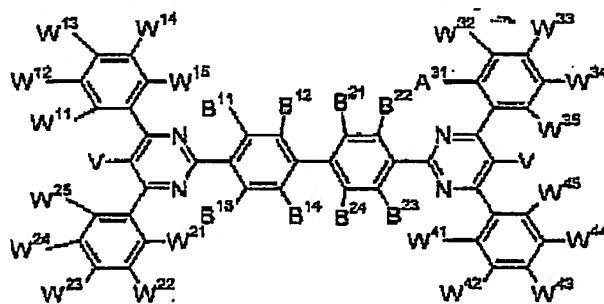
39. A pyrimidine compound of formula



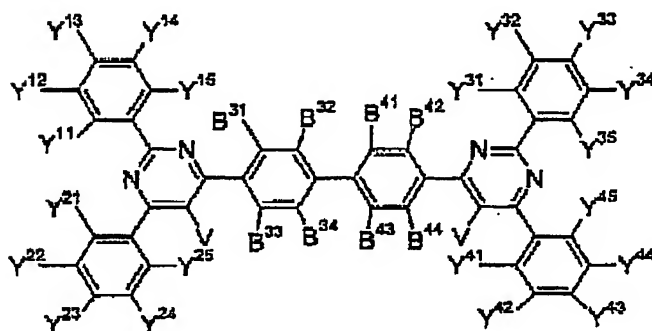
(IV), wherein

V, W¹ to W⁵, X¹ to X⁵ and Y¹ to Y⁵ are as defined in claim 9.

40. A pyrimidine compound of formula



(VI) or



(VII), wherein

W¹¹ to W¹⁵, W²¹ to W²⁵, W³¹ to W³⁵, W⁴¹ to W⁴⁵, Y¹¹ to Y¹⁵, Y²¹ to Y²⁵, Y³¹ to Y³⁵ and Y⁴¹ to Y⁴⁵ are independently of each other H; C₆-C₁₈aryl; C₆-C₁₈aryl which is substituted by G; C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₇-C₁₈alkylaryl; C₇-C₁₈alkylaryl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl; C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy; C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; -NR⁵R⁶; C₂-C₁₈heteroaryl; C₂-C₁₈heteroaryl which is substituted by L; -SOR⁴; -SO₂R⁴; -COR⁸; -COOR⁷; -CONR⁵R⁶; C₄-C₁₈cycloalkyl; C₄-C₁₈cycloalkyl which is substituted by

E and/or interrupted by D; C₄-C₁₈cycloalkenyl; C₄-C₁₈cycloalkenyl which is substituted by E and/or interrupted by D;

V is H; C₆-C₁₈aryl; C₆-C₁₈aryl which is substituted by G; C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₇-C₁₈alkylaryl; C₇-C₁₈alkylaryl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl; C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy, C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; or -NR⁵R⁶; C₂-C₁₈heteroaryl; C₂-C₁₈heteroaryl which is substituted by L; -SOR⁴; -SO₂R⁴; -COR⁶; -COOR⁷; -CONR⁵R⁶; C₄-C₁₈cycloalkyl; C₄-C₁₈cycloalkyl which is substituted by E and/or interrupted by D; C₄-C₁₈cycloalkenyl; C₄-C₁₈cycloalkenyl which is substituted by E and/or interrupted by D; B¹¹ to B¹⁴, B²¹ to B²⁴, B³¹ to B³⁴ and B⁴¹ to B⁴⁴ are independently of each other H; C₆-C₁₈aryl; C₆-C₁₈aryl which is substituted by G; C₁-C₁₈alkyl; C₁-C₁₈alkyl which is substituted by E and/or interrupted by D; C₇-C₁₈alkylaryl; C₇-C₁₈alkylaryl which is substituted by E and/or interrupted by D; C₂-C₁₈alkenyl; C₂-C₁₈alkenyl which is substituted by E and/or interrupted by D; C₂-C₁₈alkynyl; C₂-C₁₈alkynyl which is substituted by E and/or interrupted by D; C₁-C₁₈alkoxy, C₁-C₁₈alkoxy which is substituted by E and/or interrupted by D; -SR⁵; -NR⁵R⁶; C₂-C₁₈heteroaryl; C₂-C₁₈heteroaryl which is substituted by L; -SOR⁴; -SO₂R⁴; -COR⁶; -COOR⁷; or -CONR⁵R⁶; C₄-C₁₈cycloalkyl; C₄-C₁₈cycloalkyl which is substituted by E and/or interrupted by D; C₄-C₁₈cycloalkenyl; C₄-C₁₈cycloalkenyl which is substituted by E and/or interrupted by D; wherein D, E, G, L, R⁴, R⁵, R⁶, R⁷ and R⁸ are as defined in claim 9.

ELECTROLUMINESCENT DEVICE**Abstract of the Disclosure**

Disclosed are electroluminescent devices that comprise organic layers that contain certain organic compounds containing one or more pyrimidine moieties. The organic compounds containing one or more pyrimidine moieties are suitable components of blue-emitting, durable, organo-electroluminescent layers. The electroluminescent devices may be employed for full color display panels in for example mobile phones, televisions and personal computer screens.

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